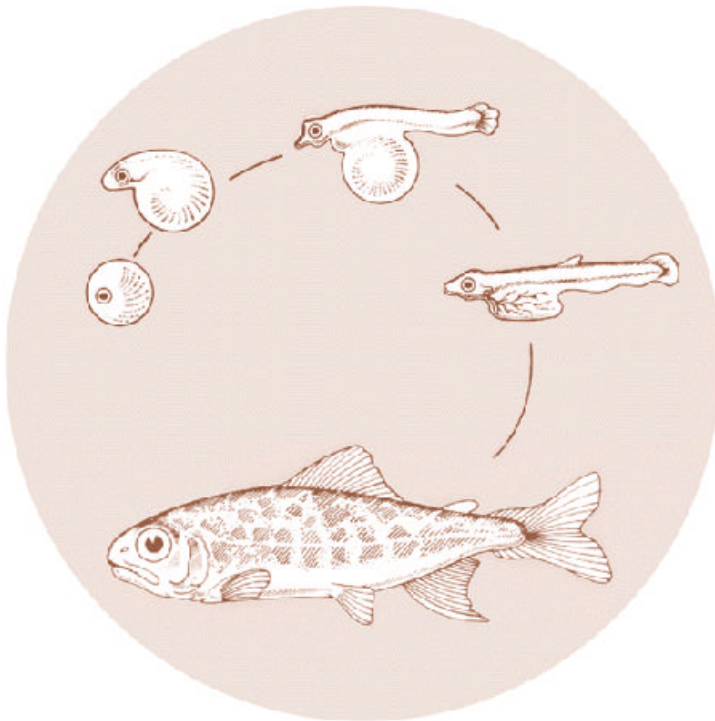


June 1996

**OPERATION PLANS FOR ANADROMOUS FISH
PRODUCTION FACILITIES IN THE COLUMBIA RIVER
BASIN VOLUME III - WASHINGTON**

Annual Report 1995



DOE/BP-60629-11



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**Operation Plans for Anadromous Fish Production
Facilities in the Columbia River Basin
Volume III—Washington**

Annual Report 1995

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Codes, Acronyms, and Abbreviations Used in This Report

Species Codes

CHF	Fall Chinook
CHS	Spring Chinook
CHR	Summer Chinook
COH	Coho
CT	Cutthroat Trout (Resident)
RB	Rainbow Trout
SCT	Sea-run Cutthroat Trout
SOC	Sockeye
STS	Summer Steelhead
STU	Sturgeon
STW	Winter Steelhead
Type-N	Late-run Coho
Type-S	Early-run Coho
URB	Upriver Bright Fall Chinook

Disease/Pathogen Codes

BGD	Bacterial Gill Disease
BKD	Bacterial Kidney Disease
<i>C. shasta</i>	<i>Ceraomyxa shasta</i>
CAD	Coho Anemia Disease
Colum.	Columnaris (<i>Flexibactor columnaris</i>)
CWD	Cold Water Disease
EIBS	Erythrocytic Inclusion Body Syndrome
ERM	Enteric Red Mouth
Furunc.	Furunculosis
Ich	<i>Ichthyophthirius multifiliis</i>
IHN	Infectious Hematopoietic Necrosis
IPN	Infectious Pancreatic Necrosis
MAS	Motile Aeromonas Septicemia
<i>M. cere.</i>	<i>Myxosoma cerebralis</i>
VHS	Viral Hemorrhagic Septicemia

Water Supply Codes

CS	Surface water with no fish present
G	Ground water
S	Surface water
SA	Surface water containing anadromous fish
SR	Surface water with only resident fish
ST	Treated surface water, depurated
SW	Salt water

Acronyms and Abbreviations

BPA	Bonneville Power Administration
CIS	Coordinated Information System
COE	Corps of Engineers
CRITFC	Columbia River Inter-Tribal Fish Commission
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
CWT	Coded-Wire Tag
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FTE	Full Time Equivalent
IDFG	Idaho Department of Fish and Game
IHOT	Integrated Hatchery Operations Team
LSRCP	Lower Snake River Compensation Plan
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NPPC	Northwest Power Planning Council
ODFW	Oregon Department of Fish and Wildlife
PAC	Production Advisory Committee
PNFHPC	Pacific Northwest Fish Health Protection Committee
PP&L	Pacific Power and Light
PUD	Public Utility District
TAC	Technical Advisory Committee
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife (formerly Washington Department of Fisheries and Washington Department of Wildlife)
YIN	Yakama Indian Nation

Anadromous Fish Production Facilities in the Columbia River Basin

Anadromous Fish Production Facilities in Washington

**INTEGRATED
HATCHERY
OPERATIONS
TEAM**



Washington Department of Fish and Wildlife Hatchery Operation Plans

Beaver Creek Hatchery/Gobar Pond

INTRODUCTION

Beaver Creek Hatchery is located on the Elochoman River about 10 miles upstream from the river mouth. The Elochoman River is a north bank tributary of the lower Columbia River, just downstream of Cathlamet, Washington.

The facility consists of 10 intermediate raceways, 20 raceways, 1 earthen rearing pond, 2 adult holding ponds, and a hatchery building with 60 troughs. It is staffed with 4 FTE's.

Water rights total 16,013 gpm from three sources: Elochoman River, Beaver Creek and a well. Beaver Creek water is gravity flow while the other two sources are pumped. The Elochoman River is used in summer and fall while Beaver Creek water is used from mid-November through mid-May. Filtered well water (1 cfs) is used to incubate eggs and for early rearing of fry. Water use in summer is about 5,800 gpm. Gobar Pond, a 0.93-acre earthen rearing pond located on Gobar Creek (Kalama River tributary), is operated as a satellite facility.

Rearing Facilities at Beaver Creek Hatchery/Gobar Pond

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Buckets					320		Plastic	14	Fair	Used in troughs
Circular Tanks	16		5	1,000	2	2,000	Fiberglass	7	Good	Not setup
Earthen Rearing Pond				217,800	1	217,800	Earth	16	Good	One surface only
Heath-type Incubators					4		Fiberglass	30	Fair	Add-on system
Holding Raceways	96.5	11.8	3.7	4,327	2	8,654	Concrete	38	Fair	Holding and rearing
Intermediate Rwys	27.5	3.8	2	209	10	2,090	Concrete	38	Fair	
Lower Adult Trap				126	1	126	Conc/Wood	38	Fair	Adult Trap Only
Production Rwys	79.5	9.8	2.2	1,636	20	32,720	Concrete	38	Fair	
Smolt Trap	43.8	4.58	2.7	532	2	1,064	Concrete	16	Good	
Troughs	16.4	1	.5	8	40	8	Concrete	38	Fair	6 baskets/trough
Troughs	4.5	1.2	1	5	20	104	Fiberglass	26	Fair	
Upper Adult Trap				138	1	138	Conc/Wood	38	Fair	
Rearing Pond	450	90	6	243,000	1	243,000	Earth		Fair	
Smolt Trap	40	9	3	1,080	1	1,080	Concrete	21	Fair	

PURPOSE

Beaver Creek Hatchery was authorized under the Mitchell Act and began operating in 1957 as part of the Columbia River Fisheries Development Program—a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. The facility is currently used for adult collection, egg incubation and rearing of winter steelhead and sea-run cutthroat trout. It is also used for egg incubation and rearing of summer steelhead (adult collection and spawning occurs at Skamania Hatchery). The National Marine Fisheries Service funds the hatchery operation and maintenance.

Gobar Pond was constructed by Weyerhaeuser Corporation and began operation in 1975. The pond is used to rear and acclimate summer and winter steelhead pre-smolts prior to smolt release.

GOALS

Produce adult winter steelhead, summer steelhead and sea-run cutthroat for harvest by sport anglers while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead

Produce 260,000 smolts for on-station and off-station release.

Summer Steelhead

Produce 230,000 smolts for on-station and off-station release.

Sea-run Cutthroat

Produce 50,000 smolts for on-station and off-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and differential spawning time from wild fish (winter steelhead).

Objective 4 Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Beaver Creek Hatchery is to collect enough adults to maintain the hatchery production program.

Winter Steelhead: : Entry of adult hatchery fish into the subbasin occurs from mid-November through February, with a peak in December. Adults are captured and spawned at the hatchery.

Summer Steelhead: : Summer steelhead are not indigenous to the Elochoman River but were first planted in 1982. Hatchery summer steelhead enter the subbasin from May through August. Broodstock are not captured on the Elochoman; eggs are obtained from Skamania Hatchery on the Washougal River.

Sea-run Cutthroat: Adults enter the subbasin from July through October and are captured at the hatchery from October through January.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with

naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: : One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/ pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: : The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Beaver Creek Hatchery/Gobar Pond

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Winter Steelhead: : Rear 260,000 fish to a size of 4-8 fish/ pound and volitionally release approximately 30 percent on-station between April 15 and May 15. The remaining smolts are released off-station at the following sites:

Kalama River	25,000
Grays River	15,000
Abernathy Creek	15,000
German Creek	15,000
Coweeman Creek	15,000

Skamokawa Creek 15,000

In addition, 60,000 pre-smolts are transported to Gobar Pond in February for volitional release between April 15 and May 15. All winter steelhead are marked prior to release.

Summer Steelhead: Rear 230,000 fish to a size of 4-8 fish/pound and release approximately 10 percent on-station between April 15 and May 15. Remaining smolts are released off-station at the following sites.

East Fork Lewis River	20,000
Kalama River	35,000
North Fork Toutle River	35,000
South Fork Toutle River	35,000
Green River	15,000

Approximately 60,000 pre-smolts are transported to Gobar Pond in February and volitionally released between April 15 and May 15. All summer steelhead are marked prior to release.

Sea-run Cutthroat: Rear 50,000 smolts to a size of 3-5 fish/pound and release 60 percent on-station between April 15 and May 15. The remaining smolts are released off-station at the following sites:

Mill Creek	5,000
Abernathy Creek	5,000
German Creek	5,000
Coweeman Creek	5,000

All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity

Broodstock Selection

Adult hatchery winter steelhead fish are collected and spawned from December through February. Early spawning fish have historically been selected for hatchery broodstock so that spawning time of returning hatchery fish precedes wild fish. All hatchery spawning is completed by February 1, while most wild fish spawn in April and May.

Sea-run cutthroat broodstock have also been selected for early spawning fish, which inhibits returning hatchery fish from crossbreeding with wild fish. However, in years of low returns, nearly all fish are spawned.

No summer steelhead adults are collected on the Elochoman.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults. Fish are usually spawned at a 2:1 male-to-female ratio. Most egg-takes are used in hatchery production.

Acceptable Stocks

Importing eggs from other facilities with acceptable stocks is occasionally done when insufficient number of eggs are available at Beaver Creek Hatchery. Eggs from adults returning to the hatchery are always given priority for on-station use. However, if inadequate numbers are available, other lower Columbia River hatchery stocks such as the Cowlitz and Kalama have been used.

Objective 4: : Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, pathologist approved treatments may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Beaver Creek Hatchery

Health Monitoringg

- At spawning, a minimum of 60 ovarian fluids, 60 milts and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- Prior to transfer or release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 time per quarter on composite effluent and influent samples.
- *Settleable Solids (SS)* – 1 time per week on effluent and influent samples.
- *In-hatchery Water Temperatures* – daily maximum and minimum readings.

Objective 6 Communicate effectively with other steelhead producers and managers

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The

Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—BEAVER CREEK HATCHERY

Objective 1{xe "Objective 1"}

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STW	1,200	854	414-1,234	1
	STS	N/A	N/A	N/A	
	SCT	450	681	493-929	
Adult Prespawning		STW	95%	97.7%	97.5-97.9%
Survival	STS	STS	N/A	N/A	N/A
	SCT	95%	98.0%	97.5-98.9%	
Egg-take	STW	1,000,000	753,839	342K-1,341K	1
	STS	N/A	N/A	N/A	
	SCT	200,000	163,106	95K-204K	
Green Egg-to-Fry Survival	STW	72%	85.9%	73.1-94.8%	2
	STS	72%	92.2%	72.8-99.9%	
	SCT	72%	70.9%	50.2-87.1%	
Fry-to-Smolt Survival	STW	83%	81.1%	47.7-99.8%	2
	STS	83%	89.5%	81.1-93.1%	
	SCT	83%	73.4%	0-95.1%	
Fish Releases	STW	260,000	310,529	137K-398K	2
	STS	230,000	252,181	203K-312K	
	SCT	50,000	78,665	55K-104K	
Egg Transfers	STW	0	-- ¹	-- ¹	
	STS	0	-- ¹	-- ¹	
	SCT	0	-- ¹	-- ¹	
Fish Transfers	STW	0	-- ¹	-- ¹	
	STS	0	-- ¹	-- ¹	
	SCT	0	-- ¹	-- ¹	
Adults Back to River	STW	--	--	--	
	STS	--	--	--	
	SCT	--	--	--	
Percent Survival	STW	--	3.2%	1.8-5.8%	
	STS	--	2.7%	1.5-3.7%	
	SCT	--	2.3%	1.7-3.1%	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	All	Yes	No	--	3
Proper Release Size	All	Yes	Yes	--	
Proper Release Time	All	Yes	Yes	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STW	Yes	Yes	--	N/A
	STS		N/A	N/A	
	SCT	Yes	Yes	--	
Spawning Pop. >200	STW	Yes	Yes	--	
	STS	N/A	N/A	N/A	
	SCT	Yes	Yes	--	
Spawning Ratio Male:Female	STW	2:1	1.21:1	0.89:1-1.39:1	
	STS	N/A	N/A	N/A	
	SCT	2:1	0.93:1	0.77:1 - 1.07:1	
Acceptable Stocks	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Beaver Creek Hatchery</u>	G	G,SA				
SCT/Elochoman R			IHN			
STS/Washougal R			IHN			
STW/Elochoman R			IHN			
<u>Gobar RP</u>	N/A	SA				
STS/Washougal R						
STW/Elochoman R						

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids		All	0.1 ml/L	N/A	N/A
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6{xe "Objective 6"}

<u>Measures{xe "Species"}Species</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery{xe "All"} All Records for Accuracy{xe "Records for Accuracy"} and Completeness{xe "and Completeness"}	All	Yes	Yes	--	
Develop and Review{xe "All"}		All	Yes	No	--
Equil. Brood Doc.					
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments—Beaver Creek Hatchery/Gobar Pond

1. Scars on some returning adults indicate predation by seals in the Columbia River estuary.
2. Disease problems since 1983 with IHN and Ich have limited production.
3. Physical features of the hatchery are not conducive to volitional release. Smolts from Gobar Pond are released volitionally.
4. Satellite facilities on the South fork Toutle and Coweeman River are also supplied with fish from this facility (25,000 summer steelhead smolts to the South Fork Toutle, 5,000 sea-run cutthroat to Coweeman Pond #1, and 9,000 winter steelhead to Coweeman Pond #2).

{tc "Chelan PUD Hatchery/Turtle Rock"}Chelan PUD Hatchery/Turtle Rock{xe "Chelan PUD Hatchery/Turtle Rock"}

INTRODUCTION{XE "INTRODUCTION"}

Chelan PUD Hatchery is located on the Columbia River above Rocky Reach Dam near Chelan Falls, Washington. Site elevation is 750 feet above sea level. The hatchery is located adjacent to WDFW's Chelan Trout{xe "Trout"} Hatchery. These two facilities are operated as a complex by the same staff. The Chelan complex is staffed with 4.{xe "Many males produce inadequate sperm so additional males are used."}5 FTE's.

Facility rearing units include 2 portable vinyl raceways, 16 standard raceways, 8 intermediate raceways, 1 adult holding raceway and a hatchery building with 80 troughs. The Turtle Rock rearing facility, located on an island in the Columbia River near Wenatchee, Washington, is operated as satellite.

Water rights total 14,812 gpm from three sources: a well field, the Columbia River and springs. Columbia River water is no longer used due to concern over IHN contamination. Spring water averages about 500 gpm and is the {xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."}surplus left over from the state trout hatchery program and local orchard needs. Average total water use is about 3,000 gpm, of which 2,500 gpm is well water (50-57°F). About 4,980 gpm is pumped from the Columbia River at the Turtle Rock facility.

Rearing Facilities at Chelan PUD Hatchery and Turtle Rock

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Adult Raceway	72	10	5	3,600	1	3,600	Concrete	30	Good	Re-use water only
Intermediate Rwys	28	3.8	2	214	8	1,712	Concrete	30	Good	Located indoors
Shallow Troughs	14.3	1	.5	7	80	576	Concrete	30	Good	In tandem
Standard Rwys	89	9.7	2.7	2,308	16	36,928	Concrete	30	Good	2 batteries of 8
Vinyl Lined Portables	80	8	2.6	1,651	2	3,302	Vinyl/steel	10	Good	Located indoors
Spawning Channel	200	36.2	4	29,000	4	116,000	Conc/gravel	20	Good	

PURPOSE{XE "PURPOSE"}

Chelan PUD Hatchery began operation in 1965 as a mitigation facility for Rocky Reach Dam. Chelan PUD owns the hatchery and funds its operation and

maintenance. Washington Department of Fish and Wildlife operates the facility. The facility is used for egg incubation and early rearing of summer steelhead. Fish are transferred to the Turtle Rock facility for final rearing and release. Chelan PUD Hatchery is also used for rearing resident trout and kokanee.

GOALS{XE "GOALS"}

Produce summer steelhead, resident trout and kokanee to compensate for lost fish production and recreational and tribal fishing opportunities caused by construction and operation of the Rocky Reach and Chelan hydroelectric projects.

OBJECTIVES{XE "OBJECTIVES"}

Objective 1{x\epsilon "Objective 1"}:{x\epsilon "Hatchery Production"}	Hatchery Production
$ \begin{aligned} & \text{Minimize } Z = 1000x_1 + 1500x_2 \\ & \text{Subject to } 2x_1 + 3x_2 \leq 120 \\ & \quad \quad \quad 3x_1 + 2x_2 \leq 120 \\ & \quad \quad \quad x_1, x_2 \geq 0 \end{aligned} $	$ \begin{aligned} & \text{Maximize } Z = 1000x_1 + 1500x_2 \\ & \text{Subject to } 2x_1 + 3x_2 \leq 120 \\ & \quad \quad \quad 3x_1 + 2x_2 \leq 120 \\ & \quad \quad \quad x_1, x_2 \geq 0 \end{aligned} $

Summer Steelhead{xe "Summer Steelhead"}

Produce 200,000 smolts for off-station release from the Turtle Rock rearing facility.

Trout{x e "Trout"}

Produce 200,000 legal-sized rainbow trout for a variety of off-station releases (paid by reimbursable funds).

Produce 1,070,000 fish of various size and species (paid with state funds).

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Kokanee{xe "Kokanee"}
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Produce 2,000,000 fry for release into Lake Chelan. {xe "Produce 2,000,000 fry for release into Lake Chelan."}

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3{x"Objective 3":{x"Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources."}x"Maintain stock integrity and differential spawning

time from wild fish (winter steelhead)."}{xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."} Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES{XE "OBJECTIVES"}

The sections that follow describe the current hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this {xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."}portion of the report.{xe "The sections that follow describe the current hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report."}

Objective 1{xe "Objective 1"}:{xe "Hatchery Production"} Hatchery Production{xe "Objective 1: Hatchery Production"}

Adult Collection{xe "Adult Collection"}

Adult steelhead are not captured at Chelan PUD Hatchery. Eggs from mid-Columbia steelhead stock are collected and incubated to the eyed stage at Wells Hatchery{xe "Wells Hatchery"}{xe "121"} (located 12 miles upstream) and then transferred to the Chelan PUD Hatchery.

Objective 2:{xe "Minimize interactions with other fish populations through proper rearing and release strategies."} Minimize interactions with other fish

populations through proper rearing and release strategies. Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies."

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts are released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Chelan PUD Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Summer Steelhead: Rear 200,000 summer steelhead smolts to a size of 4-8 fish/pound at the Turtle Rock rearing facility and release into the Entiat River (40,000) and Wenatchee River (160,000) from April 15 to May 15.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

No adults are collected at this facility (see Wells Hatchery Plan).

Spawning Protocol

Summer steelhead are not spawned at this facility (see Wells Hatchery Plan).

Acceptable Stocks

Eggs are imported from Wells Hatchery so that regional genetic integrity can be maintained.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control{x "Disease Control"}

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention{x "Disease Prevention"}

- Clinically healthy fish are examined to assess health status.
- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Chelan PUD Hatchery

Health Monitoring{x "Health Monitoring"}

- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control{xe "Disease Control"} Policy{xe "Creek"}.

Fish and Egg Movements{xe "Fish and Egg Movements"}

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control{xe "Disease Control"} Policy{xe "Creek"}.

Therapeutic and Prophylactic Treatments{xe "Therapeutic and Prophylactic Treatments"}

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation{xe "Sanitation"}

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health. Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids* (SS)—1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures*—daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin. Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly

and is currently developing a series of regional hatchery policies. {xe "Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies."} {xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."}

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record {xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."} Keeping {xe "Record Keeping"}

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record {xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."} keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents {xe "Development and Review of Brood Documents"}

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—CHELAN PUD HATCHERY {xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."}

Objective 1{xe "Objective 1"}

<u>Measures{xe "Species"}Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture{xe "S. Steelhead"}{xe "W. Steelhead"}STS{xe "300,000"}{xe "1,100,000"}{xe "320,000"}{xe "2,000,000"}{xe "1,500"}{xe "150,000"}{xe "250,000"}{xe "300"}{xe "4.0%"}{xe "400,000"}{xe "700,000"}{xe "1,000"}{xe "--"}{xe "0"}{xe "310,000"}{xe "NA"}N/A				N/A
Adult Prespawning{xe "S. Steelhead"}{xe "W. Steelhead"}STS{xe "300,000"}{xe "1,100,000"}{xe "320,000"}{xe "2,000,000"}{xe "1,500"}{xe "150,000"}{xe "250,000"}{xe "300"}{xe "4.0%"}{xe "400,000"}{xe "700,000"}{xe "1,000"}{xe "--"}{xe "0"}{xe "310,000"}{xe "NA"}{xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."}			N/A	N/A
Survival				
Egg-take	STS	N/A	N/A	N/A
Green Egg-to-Fry Survival	STS	90%	94.5%	89.9-97.6%
Fry-to-Smolt Survival	STS	90%	92.6%	89.4-93.5%
Fish Releases	STS	200,000	217,300	167-245K
Egg Transfers	STS	0	-- ¹	-- ¹
Fish Transfers	STS	0	-- ¹	-- ¹
Adults Back to River	STS	N/A	N/A	N/A
Percent Survival	STS	--	Unknown	Unknown

Objective 2

<u>Measures{xe "Species"}Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional{xe "S. Steelhead"}{xe "All"}STS{xe "300,000"}{xe "1,100,000"}{xe "320,000"}{xe "2,000,000"}{xe "1,500"}{xe "150,000"}{xe "250,000"}{xe "300"}{xe "4.0%"}{xe "400,000"}{xe "700,000"}{xe "1,000"}{xe "--"}{xe "0"}{xe "310,000"}{xe "NA"}No			No	--
Release{xe "Release"}				

N/A=Not applicable.

¹ Not estimated for this report.

Proper Release	{xe "S. Steelhead"}{xe "Release"}	STS	{xe "300,000"}{xe "1,100,000"}{xe "320,000"}{xe "2,000,000"}{xe "1,500"}{xe "150,000"}{xe "250,000"}{xe "300"}{xe "4.0%"}{xe "400,000"}{xe "700,000"}{xe "1,000"}{xe "--"}{xe "0"}{xe "310,000"}{xe "NA"}{xe "Necropsies of diseased and dead fish are conducted to diagnose the cause of loss."}	Yes	Yes
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Size

Proper Release Time	STS	Yes	Yes	--
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Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STS	N/A	N/A	N/A	
Spawning Pop. >200	STS	N/A	N/A	N/A	
Spawning Ratio Male:Female	STS	N/A	N/A	N/A	
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Chelan Hatchery</u> STS/Mackinaw	G	G				

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6{xe "Objective 6"}

<u>Measures{xe "Species"}Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery{xe "All"} All Records for Accuracy{xe "Records for Accuracy"} and Completeness{xe "and Completeness"}	Yes	Yes	--	
Develop and Review{xe "All"} Equil. Brood Doc.	All	Yes	No	--
Develop and Review Future Brood Doc.	All	Yes	No	--
Develop and Review Current Brood Doc.	All	Yes	No	--

Cowlitz Trout Hatchery(Blue Creek)Cowlitz Trout Hatchery (Blue Creek)

INTRODUCTION

The Cowlitz Trout Hatchery is located on the Cowlitz River about 42 miles above the mouth. The Cowlitz River is a north bank tributary of the lower Columbia River, just downstream of Longview, Washington. Site elevation is 157 feet above sea level. The facility is staffed with 7 FTE's.

The facility consists of 6 intermediate raceways, 24 raceways, four 5-acre rearing ponds, 3 adult holding raceways, and a hatchery building with 88 troughs and 4 tanks.

Water rights total 30,855 gpm from three sources: two well sources and the Cowlitz River. The two well sources provide a combined flow of about 1,500 gpm while the river provides about 24,000 gpm, when production requires such. In 1991, an ozone water treatment system to treat about 10,000 gpm was installed at the hatchery for control of *Ceratomyxa shasta*.

Currently, well water is used to incubate eggs and early rearing of fry. As fish and water needs increase, ozonated river water is used from June through late-November or early December on fingerlings. Thereafter, untreated river water is used until smolts are released.

Rearing Facilities at Cowlitz Trout Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
"A" Series Rwys	878.8	20	3	5,270	8	42,160	Concrete	28	Fair	
"B" Series Rwys	878.8	20	3	5,270	8	42,160	Concrete	28	Fair	
"C" Series Rwys	878.8	20	3	5,270	8	42,160	Concrete	28	Fair	
"F" Series Rwys	88.3	9.8	2.7	2,388	6	14,328	Concrete	28	Fair	
5-acre Ponds	1,450	160	7	1,624,000	4	6,496,000	Earth	28	Fair	
Adult Raceways	158.8	10	5	7,940	3	23,820	Concrete	28	Fair	Not for rearing
Troughs	14.4	1	.5	7	104	750	Concrete	28	Fair	

PURPOSE{XE "PURPOSE"}

Cowlitz Hatchery began operation in 1967 as a mitigation facility for dams blocking the Cowlitz River. The facility is currently used for adult collection, egg incubation and rearing of winter steelhead, summer steelhead, sea-run cutthroat, tiger muskie, and channel catfish. Tacoma City Light funds the hatchery operation and maintenance.

GOALS{XE "GOALS"}

Produce adult winter steelhead, summer steelhead and sea-run cutthroat for sport fisheries while providing adequate escapement for hatchery production. The mitigation goal is to produce 191,000 pounds of smolts and return 38,600 adult steelhead and sea-run cutthroat to the river. Washington Department of Fish and Wildlife determines the stock composition of hatchery production.

OBJECTIVES{XE "OBJECTIVES"}

Objective 1{xe "Objective 1";}{xe "Hatchery Production"} Hatchery Production

Winter Steelhead{xe "Winter Steelhead"}

Produce 660,000 smolts for on-station release.

Produce 500,000 (includes 100,000 for HARZA) fingerlings for upriver release.{xe "Produce 500,000(includes 100,000 for HARZA) fingerlings for upriver release."}

Produce 60,000 fingerlings for Friends of Cowlitz cooperative.{xe "Produce 60,000 fingerlings for Friends of Cowlitz cooperative."}

Provide 50,000 eyed eggs to co-op programs.

Summer Steelhead{xe "Summer Steelhead"}

Produce 400,000 smolts for on-station release plus 30,000 for Friends of Cowlitz cooperative.

Sea-Run Cutthroat

Produce 120,000 smolts for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

- Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.
- Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
- Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.
- Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Cowlitz Hatchery is to collect enough adults to maintain the hatchery production program.

Winter Steelhead: Entry of adult hatchery fish into the subbasin occurs from late-October through May with a peak in December and January. Adults are captured and spawned at the hatchery.

Summer Steelhead: Summer steelhead were introduced into the subbasin in 1967. Adults enter the subbasin from June through November. They are captured in summer and fall and spawned at the hatchery from December through January.

Sea-run Cutthroat: Cutthroat enter the subbasin from July through December. Adults are captured at the hatchery from August/September through January.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/ pound with a condition factor of less than 1.0. Mitigation agreement requires steelhead smolts to be 180 mm or greater in length and sea-run cutthroat to be 210 mm or greater in length.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Cowlitz Trout Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Winter Steelhead: Rear 660,000 smolts to a size of 4-8 fish/ pound and volitionally release approximately 80 percent of the fish on-station between April 15 and May 15. The remaining fish are released upstream at the Barrier Dam on May 1. Of this

600,000, 200,000 are taken to the Cowlitz Salmon Hatchery approximately March 1 to be finished rearing and acclimated prior to release from that station. Currently 400,000 late winter steelhead fry of varying size are scatter planted in the upper watershed during late September and early October. Eyed eggs are provided to the Friends of the Cowlitz sports group for enhancement projects. HARZA, a contractor on the Upper Cowlitz Falls Dam, receives 100,000 late spawning winter steelhead for rearing in net pens. Approximately 75,000 of these are trucked and released below the Barrier Dam and the remaining 25,000 are used experimental release. All fish are marked prior to release.

Summer Steelhead: Rear 400,000 smolts to a size of 4-8 fish/pound and volitionally release on-station between April 15 and May 15. All fish are marked prior to release.

Sea-run Cutthroat: Rear 120,000 smolts to a size of 3.5-5 fish/pound and volitionally release on-station between April 15 and May 15. All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adult hatchery winter steelhead fish are collected and spawned from December through early May. Spawning time has historically been selected for early maturing fish (December/January), but in recent years spawning time has been distributed throughout the entire run.

Sea-run cutthroat broodstock have also been selected for early spawning fish, which inhibits returning hatchery fish from crossbreeding with wild fish. However, in years of low return, nearly all fish are spawned.

Summer steelhead adults are collected at both the salmon and trout hatcheries in summer and fall and spawned from December through January. Generally, early maturing fish are selected although eggs from later takes are also used. No correlation between arrival in the river and spawning time has been established.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults and spawn at a 1:1 male-to-female ratio for all species. However, with sea-run cutthroat, difficulty in obtaining sperm has sometimes resulted in multiple males being used per female. Most egg-takes are used in hatchery production.

Acceptable Stocks

When the hatchery was first started, a portion of the eggs for rearing and release into Blue Creek were Beaver Creek stock, this continued from 1968-1975. Since that

time, eggs from other sources are not imported to Cowlitz as sufficient Cowlitz broodstock have been available.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Clinically healthy fish are examined to assess health status.
- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.

- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Cowlitz Hatchery

Health Monitoring

- At spawning, a minimum of 60 ovarian fluids, 60 milts and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- Prior to transfer or release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.
- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.
- An ozone treatment plant has been installed to kill infectious stage of *Ceratomyxa shasta*. Early results have shown that this treatment significantly reduces mortality caused by this disease.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures*—daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—COWLITZ TROUT HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STW	N/A	N/A	N/A	1
	STS	1,000	1,395	707-2,281	1
	SCT	5,000	1,500	383-2,947	1
Adult Prespawning Survival	STW	--	96.5%	95.4-97.6%	
	STS	--	86.1%	84.3-97.8%	
	SCT	--	92.8%	91.2-95.3%	
Egg-take	STW	1,800,000	1,933,649	1.6-2.1 million	
	STS	700,000	710,541	0.57-1.1 million	
	SCT	250,000	305,000	0.5-1.1 million	2
Green Egg-to-Fry Survival	STW	72%	88.1%	76-94%	
	STS	72%	88.7%	85-92%	
	SCT	72%	78.8%	66-89%	
Fry-to-Smolt Survival	STW	83%	42.5%	36-55%	2,3
	STS	83%	29.2%	13-45%	2,3
	SCT	83%	37.8%	3-83%	2,3
Fish Releases	STW	660,000	822,071	524K-1,179K	
	STS	400,000	255,949	82K-451K	
	SCT	115,000	76,888	10K-110K	
Egg Transfers	STW	50,000	-- ¹	-- ¹	
	STS	0	-- ¹	-- ¹	
	SCT	0	-- ¹	-- ¹	
Fish Transfers	STW	0	-- ¹	-- ¹	
	STS	0	-- ¹	-- ¹	
	SCT	0	-- ¹	-- ¹	
Adults Back to River	STW	--	--	--	1
	STS	N/A	N/A	N/A	1
	SCT	--	--	--	1
Percent Survival	STW	4.0%	2.66%	1.41-4.06%	
	STS	4.0%	5.64%	3.52-7.93%	
	SCT	11.5%	9.38%	4.30-14.34%	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	All	No	No	--	
Proper Release Size	All	Yes	Yes	--	
Proper Release Time	All	Yes	Yes	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	
Spawning Pop. >200	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	
Spawning Ratio Male:Female	STW	1:1	1.26:1	1.04:1 - 1.82:1	
	STS	1:1	1.04:1	0.62:1 - 1.58:1	
	SCT	1:1	1.23:1	1.13:1 - 1.37:1	
Acceptable Stocks	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Blue Creek Hatchery</u>	<u>Inc.</u>	<u>Rear.</u>				
SCT/Cowlitz R	G	G,SA,ST	IHN			
STS/Cowlitz R			IHN			
STW/Cowlitz R			IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50 ⁰ -56 ⁰ F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments—Cowlitz Trout Hatchery

1. Only a portion of the winter steelhead are retained for spawning. Fish are recycled back to the river and many fish enter the trap repeatedly. In addition, summer steelhead, winter steelhead and sea-run cutthroat are live-spawned and returned to the river.
2. Fry-to-smolt survival and number of eggs taken have been altered since the 1991 completion of the ozone water treatment system.
3. Fry-to-smolt survival reduced because of bird predation.

{tc "Cowlitz Salmon Hatchery(Salkum)"}Cowlitz Salmon Hatchery (Salkum)

INTRODUCTION

Cowlitz Salmon Hatchery is located on the Cowlitz River (river mile 45) approximately 10 miles from Mossyrock, Washington. Elevation of the facility is 250 feet above sea level.

Cowlitz is a large hatchery that includes a fish ladder, adult return separation facility, 36 modified Burrows ponds (14 of which can be used for juvenile or adult holding), 18 kettles, hatchery building and maintenance facilities. The facility is staffed with 13.83 FTE's.

Water rights are held by Tacoma City Light and total 89,776 gpm (200 cfs) from the Cowlitz River and 1,000 gpm from wells. The hatchery is supplied from three sources, all pumped. The majority of water is supplied from the Cowlitz River with an average 68,800 gpm available to the rearing ponds. An additional 14,000 gpm is available for the fish separator and ladder. The remaining two sources are C-wells (500 gpm) and PW-wells (500 gpm). The wells are only used between September and April, normally for egg incubation and early fry rearing.

Rearing Facilities at Cowlitz Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Heath Incubators					4,320		Fiberglass	28	Fair-Poor	
Burrows Ponds				15,000	31	465,000	Concrete	28	Good	
Burrows Ponds				11,000	5	55,000	Concrete	28	Good	

PURPOSE

The hatchery was built in 1967 and is owned and funded by Tacoma City Light as mitigation for the fishery impacts caused by Mossyrock and Mayfield dams. The facility is used for adult collection, egg incubation, and rearing of fall chinook, spring chinook and late (Type-N) coho. It also provides some eggs and fish for volunteer and/or educational fish rearing projects. Steelhead and cutthroat trout are also collected at this facility, with some fish shipped upstream and some downstream.

GOALS

The mitigation goal is established at 17,300 spring chinook adults, 8,300 fall chinook adults and 25,500 coho adults returning to Cowlitz River barrier dam.

OBJECTIVES

Objective 1: Hatchery Production

Fall Chinook

Produce 6,500,000 subyearlings for on-station release.

Provide 10,500 eggs/fish to co-op programs.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-N Coho

Produce 4,700,000 yearlings for on-station release.

Produce 800,000 to 1,200,000 subyearlings for upstream resident coho fishery.

Provide 61,200 eggs/fish to co-op programs.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Spring Chinook

Produce 1,752,000 yearlings and subyearlings for on-station release.

Provide 60,000 eggs/fish to co-op programs.

Provide fingerlings for Upper Cowlitz Anadromous Fish Restoration

Provide eggs/fish (surplus to on-station needs) to other facilities.

Steelhead

Imprint 80,000-160,000 steelhead smolts - April release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with state and federal water quality standards.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The primary intent of the adult collection procedures at Cowlitz Hatchery is to collect enough adults to 1) sustain the mitigation program through sufficient broodstock returns, 2) provide restocking of the upper Cowlitz watershed with coho, spring chinook and fall chinook adults, and 3) provide a limited number of eggs to other hatchery programs.

Fall Chinook: Adult fall chinook return from mid-August until November. Peak spawning usually occurs in mid-October. Broodstock are collected and separated at the hatchery.

Spring Chinook: Adults return to the Cowlitz River from March through July. Spawning occurs from August to September with a peak usually in September. Adults are collected and separated at the hatchery.

Type-N Coho: Adults return from mid-September to February. Peak spawning occurs in late November and early December. Hatchery broodstock are collected and separated on-site.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Fall Chinook: Rear 6.5 million fish to a size of 50-80 fish/pound and release on-station (acclimated) in May-June.

Type-N Coho: Rear 800,000 - 1.2 million coho to a size of 50 fish/pound and release into upper Cowlitz River tributaries and Riffe Lake in July-August. Rear 4.7 million coho to a size of 20 fish/pound and release on-station (acclimated) in May-June the following year.

Spring Chinook: Rear approximately 100,000 spring chinook to a size of 30-40 fish/pound and release on-station (acclimated) from May to July. Rear 1,440,000 fish to a size of 4 fish/pound and release on-station (acclimated) in March-April of the following year.

Steelhead: Imprint 80,000 to 160,000 smolts for April release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adults are collected throughout the entire run at the Cowlitz Salmon Hatchery adult fish separation facility to ensure that the run timing for these stocks is maintained. Any fish identified as non-Cowlitz origin are not used in spawning.

Spawning Protocol

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Spring chinook eggs for this facility were originally obtained from the Willamette River as well as the Cowlitz River. Tule fall chinook eggs were obtained from the Toutle River. Currently, importing eggs/fish from other facilities is not done at this hatchery and eggs from hatchery-returning adults are always given priority for station use. The stocks approved for use at the Cowlitz Hatchery are listed below.

Fall Chinook

1 Cowlitz River fall chinook

Type-N (Late) Coho

1 Cowlitz River Type-N (early, middle and late components)

Spring Chinook

1 Cowlitz River spring chinook

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fishery. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Cowlitz Salmon Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.
- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from all spring chinook females. ELISA is used to

detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*).

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult fall chinook are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.

- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to incubation room or exit from spawning area) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 time per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by steam flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring

- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the

basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—COWLITZ SALMON HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHS	17,300	5,960	4,642-7,922	1
	CHF	8,300	5,309	2,356-11,376	1
	Type-N COH	25,500	23030	5,641-46,303	1
Adult Prespawning Survival	CHS	90%	95.5%	91.6-96.8%	
	CHF	90%	89.6%	81.9-95.9%	
	Type-N COH	90%	95.3%	93.2-97.4%	2
Egg-take	CHS	2,132,000	3,946,600	3,337K-5,472K	
	CHF	7,660,000	8,239,200	5,179K-13,040K	
	Type-N COH	7,010,000	9,090,400	6,465K-10,634K	
Green Egg-to-Fry Survival	CHS	90%	84.9%	74.3-90.6%	3
	CHF	90%	88.3%	80.0-93.6%	3
	Type-N COH	90%	86.6%	82.1-91.4%	3
Fry-to-Smolt Survival	CHS	90%	88% ¹	61.3-96.6% ¹	
	CHF	90%	96.4%	91-98.6%	
	Type-N COH	90%	74.9%	53.6-82.5%	2
Fish Releases	CHS	1,440,000	940,651 ²	518K-1,252K	
	CHF	6,500,000	6,572,540 ³	4,303K-8,060K	
	Type-N COH	4,700,000	4,288,160 ⁴	3,177K-4,686K	
Transfers to Co-ops (Eggs/Fish)	CHS	60,000	57,856	2K-57K ⁵	
	CHF	10,500	--	--	
	Type-N COH	61,200	197,400	10K-870K	
Other Transfers (Eggs/Fish)	CHS	300K-2,000K	86,300	57K-115K	
	CHF	300K-8,000K	266,500	0K-526K	
	Type-N COH	2,000K-8,000K	129,200	0-2,226K	
Adults Passed Upstream	CHS	500 ⁶	1,188 ⁷	762-2,303	1
	CHF	--	382 ⁸	0-382	1
	Type-N COH	10,000	12,909	1,994-28,660	1

N/A=Not applicable.

¹ Average of four broods, 1988-1991.

² Does not include subyearling releases. Average of four broods, 1988-1991.

³ Includes fall releases.

⁴ Data from five broods, 1987-1991.

⁵ Two years of data. One year's transfer was 2,000 fish.

⁶ Passed downstream.

⁷ Three broods only, 1991 and 1993.

⁸ One year only, 1993.

Objective 1 (continued)

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Percent Survival	CHS	1.0%	2.70%	0.39-7.44%	4
	CHF	2.5%	1.09%	0.04-3.17%	
	Type-N COH	3.0%	3.80%	1.66-7.32%	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHS	Yes	9.8%	9.3-10.4%	2
	CHF	Yes	10.4%	9.1-11.8%	2
	Type-N COH	Yes	9.6%	10.0-10.8%	2
Acclimation	CHS	Yes	Yes	--	
	CHF	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	
Volitional Release	CHS	Yes	No	--	5
	CHF	Yes	No	--	5
	Type-N COH	Yes	No	--	5

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHS	Yes	Yes	Yes	
	CHF	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Pop. >500	CHS	Yes	Yes	Yes	
	CHF	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHS	1:3 ¹	0.8:1	0.7:1 - 1.1:1	
	CHF	1:3 ¹	0.8:1	0.8:1 - 1.1:1	
	Type-N COH	1:3 ¹	0.8:1	0.7:1 - 0.8:1	

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHS	Yes	Yes	--	6
	CHF	Yes	Yes	--	6
	Type-N COH	Yes	Yes	--	6

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Salkum Hatchery</u>	G,SA	G,SA				
CHS/Cowlitz R			IHN	+		
CHF/Cowlitz R			IHN	+		Paramyxovirus
COH/Type-N				+		
COH/Type-S				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	3.6	nd-18	
TSS Max Effluent	All	15 mg/L	5.7	5-27	
SS Effluent	All	0.1 ml/L	Trace	Trace-0.1	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	<18.0°C	12.1	11.2-13.4	
Downstream DO	All	Varies	11.0 mg/L	10.0-12.5	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	7
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	8
Develop and Review Future Brood Doc.	All	Yes	Yes	--	7
Develop and Review Current Brood Doc.	All	Yes	Yes	--	7

Constraints/Comments—Cowlitz Salmon Hatchery

1. Harvest rates set on other tule stocks impact escapement to the hatchery. Lack of adequate broodstock results in failure to pass fish upstream. Poor survival of some broods of spring chinook or tule fall chinook results in lowered escapement. Disease transmission concerns have reduced or eliminated putting fall chinook upstream.
2. Poor pond design and excessive handling during the sorting process can increase adult mortalities. The poor pond design can also increase the size variation in juvenile populations and increase mortality due to increased disease problems. To counter the increased disease problems, numerous prophylactic and therapeutic drug treatments are used. Because ponds operate at efficiency with large numbers of juvenile fish, several different egg-takes are often combined in one pond which can increase size variation.
3. Iron bacteria in the well water used for incubation can increase mortality.
4. Lack of current, continuous tag data.
5. Ponds are not designed for volitional release.
6. Leaky valves allow seepage of river water into well lines; therefore, well water is not pathogen free. Fish can move from one pond to the next because of faulty seals and submerged water inflow system. Leakage occurs between adjacent rearing ponds and kettles; therefore, water is exchanged freely.

7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
8. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Eastbank Hatchery"}Eastbank Hatchery

INTRODUCTION

Eastbank Hatchery is located on the east side of the Columbia River near Rocky Reach Dam, 7 miles north of Wenatchee, Washington. The hatchery is staffed with 2 FTE's.

The former Washington Department of Wildlife portion of the hatchery consists of one raceway, two 0.5-acre rearing ponds, and a hatchery building with 4 fiberglass troughs and 16 vertical incubator stacks. Eastbank Hatchery uses well water and this portion of the hatchery uses up to 10 cfs.

PURPOSE

Eastbank Hatchery began operation in 1989 as mitigation for lost steelhead production caused by Rock Island Dam. It is funded by the Chelan County PUD. The facility is used for egg incubation and rearing of summer steelhead.

GOALS

Produce adult summer steelhead to replace lost steelhead production caused by the construction and operation of Rock Island Hydroelectric Project.

OBJECTIVES

Objective 1: Hatchery Production

Produce 200,000 summer steelhead smolts for off-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

- Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
- Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.
- Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

No adult steelhead are collected at Eastbank Hatchery. Eggs are shipped in from Wells Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Eastbank Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Summer Steelhead: Summer steelhead is the only fish stock reared at this hatchery. The current strategy is to rear 200,000 fish to a size of 4-8 fish/pound and release in the Wenatchee River from April 15 to May 15. Additional summer steelhead from Chelan Hatchery are reared from November to April at Turtle Rock, and a portion of that program is released into the Entiat River in addition to the Wenatchee River.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

No adults are collected at this facility (see Wells Hatchery Plan).

Spawning Protocol

No steelhead are spawned at this facility (see Wells Hatchery Plan).

Acceptable Stocks

Eggs are obtained from steelhead returning to Wells Hatchery, an upper Columbia River facility. This egg source is thought to be appropriate for adult steelhead returning to the upper Columbia River.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Eastbank Hatchery

Health Monitoring

- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures* – daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—EASTBANK HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STS	N/A	N/A	N/A	
Adult Prespawning Survival	STS	N/A	N/A	N/A	
Egg-take	STS	N/A	N/A	N/A	
Green Egg-to-Fry Survival	STS	90%	91.4%	82.6-98.8%	
Fry-to-Smolt Survival	STS	90%	90.1%	81.0-99.2%	1
Fish Releases	STS	200,000	186,143	167K-200K	1
Egg Transfers	STS	0	-- ¹	-- ¹	
Fish Transfers	STS	0	-- ¹	-- ¹	
Adults Back to River	STS	N/A	N/A	N/A	
Percent Survival	STS	--	Unknown	Unknown	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	STS	No	No	--	
Proper Release Size	STS	Yes	Yes	--	
Proper Release Time	STS	Yes	Yes	--	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STS	N/A	N/A	N/A	
Spawning Pop. >200	STS	N/A	N/A	N/A	
Spawning Ratio Male:Female	STS	N/A	N/A	N/A	
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Eastbank Hatchery</u> STS/Wells	G	G				
<u>Turtle Rock RP</u> STS/Wells	N/A	SA	IPN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	55-56°F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments—Eastbank Hatchery

1. Inability to cool water during the early rearing period results in a wide range of smolt sizes at release and a high percentage (up to 20 percent) of precocious males. Currently chilled water has been plumbed into the incubator stacks and the small indoor rearing troughs. The use of chilled water has reduced the percentage of precocious males to 3% during initial trials.

{tc "Rock Island Hatchery Complex"}Rock Island Hatchery Complex (Eastbank and Satellites)

INTRODUCTION

The Rock Island Hatchery Complex consists of a central hatchery (Eastbank) and five satellite rearing facilities. The five satellite facilities are located on four different rivers (Wenatchee, Chiwawa, Methow and Similkameen). The Eastbank facility is located on the mainstem Columbia River just above Rocky Reach Dam, approximately 10 miles north of East Wenatchee, Washington. The hatchery was built to mitigate for smolt losses at Rock Island Dam and serves as a hub for the five satellite facilities. The hatchery began operation in 1989. Hatchery funding is provided by Chelan County PUD. The facility is operated by WDFW and a total of 7.5 FTE's are provided.

The facility consists of two adult salmon holding ponds, eight raceways, and five raceways. There is one (10' x 70') adult steelhead holding pond and two (0.5-acre) steelhead rearing ponds. A hatchery building houses shallow troughs and numerous double stacks of vertical incubators.

Rearing Facilities at Eastbank and Rock Island Hatchery Complex

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Raceway				22,000	5	110,000	Concrete	6	Good	
Raceway				3,700	7	25,900	Concrete	6	Good	
Rearing Pond				52,000	2	104,000	Concrete	6	Good	
Shallow Troughs				30	6	180	Concrete	6	Good	
Raceway				3,760	1	3,760	Concrete	6	Good	
Rearing Pond				36,000	30	1,080,000	Concrete	6	Good	
Rearing Pond				2,386	1	2,386		6	Good	Similkameen Pond
Raceway				168	2	336	Concrete	6	Good	Similkameen
Rearing Pond				75,000	2	150,000		6	Good	Chiwawa Pond
Net Pens				7,400	8	59,200	Synth. Mesh	6	Good	Lake Wenatchee
Rearing Pond				115,200	1	115,200	Lined Pond	6	Good	Dryden
Rearing Pond				53,400	1	53,400	Lined Pond	6	Good	Carlton Pond

Four deep aquifer wells provide up to 53 cfs of water at a relatively constant temperature. The hatchery has chillers to cool the incubation water and retard egg and alevin development. Satellite facilities associated with Eastbank Hatchery include the Lake Wenatchee net pens, and the Chiwawa, Dryden, Similkameen and Methow rearing ponds. As an aggregate, these facilities are supplied with approximately 89 cfs of river water.

The Chiwawa/Lake Wenatchee complex has a rearing site located on the Chiwawa River approximately one mile upstream of the confluence with the Wenatchee River. The hatchery has an office, two large rearing ponds, a removable, picket diffuser weir and trap. The facility rears only spring chinook. The facility has two water sources: the Chiwawa River (21 cfs, pumped) or the Wenatchee River (12 cfs, pumped). The latter water source is available for use from November until March when ice forms in the Chiwawa River. In addition to rearing spring chinook, sockeye juveniles are reared in six floating net cages on Lake Wenatchee. Two additional floating cages are used for holding adult sockeye until spawning. These two cages are kept separate from the remaining six cages to prevent disease transmittal. The remaining six cages are used for rearing juvenile sockeye until their release into Lake Wenatchee in the fall. This facility is staffed with 2.75 FTE's.

The Dryden rearing facility consists of a large, lined rearing pond located adjacent to the Wenatchee River in Dryden, Washington. It is used to acclimate Wenatchee summer chinook. The water supply (32 cfs) originates from an irrigation canal that takes water from the Wenatchee River at Dryden Dam. The intake is located less than a mile upstream of the pond. There are no buildings at this site.

The Similkameen rearing facility is located on the Similkameen River near Oroville, Washington. The facility has an office, small shop and a large rearing pond used for rearing Okanogan summer chinook. The water supply (21 cfs) is pumped from the Similkameen River. An aeration system was recently installed to supply oxygen to the pond during periods when water flow is shut off, due to ice formation or toxic spills in the river. The facility is staffed with 1.75 FTE's.

The Methow facility consists of a large, lined rearing pond located on the Methow River near Twisp, Washington. There is also a small office on site. This facility is used to acclimate Methow summer chinook. Water (15 cfs) is pumped from the Methow River.

PURPOSE

Eastbank Hatchery and the various satellite facilities began operating in 1989. The hatchery complex is one of three components of the mitigation agreement relating to

the construction of Rock Island Dam. The mitigation agreement requires that hatchery production be equivalent to the number of naturally produced adults lost due to smolt mortality at Rock Island Dam. Furthermore, the mitigation agreement requires that the hatchery program be consistent with maintenance of genetically distinct stocks or populations.

The satellite facilities serve two functions: 1) collection of native salmon for broodstock, and 2) a site to rear and release salmon progeny from each river's respective broodstock. Broodstock selection and spawning protocols reflect the need to maintain genetic diversity of these separate populations.

GOALS

Use artificial propagation to replace adult production lost due to smolt mortality at the Rock Island Project, while not reducing the natural production or long-term fitness of salmon and steelhead populations in the mid-Columbia River. The Rock Island Settlement Agreement has specific goals for meeting the mitigation agreement. The specific goals for hatchery production are to trap sufficient broodstock to meet programmed release numbers, and use fish cultural methods that result in 1) maintenance of the genetic integrity of the native stock, and 2) the release of high quality smolts from the facility.

OBJECTIVES

Objective 1: Hatchery Production

Produce 672,000 yearling spring chinook for release into the Chiwawa River from the Chiwawa rearing facility to replace 1,750 adults.

Produce 864,000 yearling summer chinook for release into the Wenatchee River from the Dryden rearing pond to replace 1,990 adults.

Produce 200,000 subyearling sockeye for release into Lake Wenatchee from the Lake Wenatchee net pens to replace 1,800 adults.

Produce 400,000 yearling summer chinook for release into the Methow River from the Methow rearing pond to replace 600 adults.

Produce 576,000 yearling summer chinook for release into the Similkameen River from the Similkameen rearing pond to replace 864 adults.

- Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.
- Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.
- Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
- Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.
- Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin, and with the spill coordination subcommittee.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Chiwawa Spring Chinook: There have been insufficient numbers of broodstock collected every year since this facility began operating. The picket diffuser floating weir has not been effective in trapping adults. In 1992, the weir was washed out prior to the arrival of adults. Because of the ineffectiveness of the trap, gaffing or seining adult fish in the river spawning beds has been necessary to obtain eggs. Unripe adults are transported to Eastbank Hatchery for holding and subsequent spawning. Eggs taken from ripe females at the gaffing/seining sites are also taken to Eastbank Hatchery. If the weir is operating as designed, no more than one-third of the trapped adults are kept for broodstock and the remaining fish are allowed to pass upstream. Protocols for each year's adult collection are developed in the year of return.

Wenatchee Summer Chinook: Insufficient numbers of adults had been collected until adult program goals were met in 1993. Temporary modifications at Dryden Dam in 1992 were largely successful in increasing the number of fish trapped. Permanent modifications were completed in the summer of 1992. When insufficient numbers of broodstock are captured at Dryden Dam, up to 25 percent of the needed broodstock can be trapped at Tumwater Dam. Unripe females are transported to Eastbank Hatchery for holding and subsequent spawning.

Lake Wenatchee Sockeye: Sufficient numbers of adults are captured at Tumwater Dam on the mainstem Wenatchee River. Adults are transported to Lake Wenatchee net pens until maturity. Unfertilized eggs are transported to the Eastbank Hatchery for incubation. Fry are then returned to the net pen complex and reared until the fall when they are released into the lake. On occasion, females excess to program needs are inadvertently retained because of the difficulty in sexing the fish at the time of capture. Beginning in 1993, these excess adults will be released into Lake Wenatchee to spawn naturally in the tributaries.

Methow/Okanogan Summer Chinook: Adults are captured at the fish ladder at Wells Dam or as volunteers to the Wells Hatchery collection channel. The fish are held at Wells Hatchery until maturity and then spawned. The eggs are transported to Eastbank.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Fish production at Rock Island Hatchery Complex is intended to replace fishery losses caused by Rock Island Dam while maintaining genetically distinct populations or stocks. To accomplish this goal, hatchery rearing and release procedures include acclimation to parent river water for a minimum of six weeks prior to release. This imprinting is expected to reduce the staying of these stocks into other areas that contain different stocks of fish and reduce interbreeding. The rearing and release strategies are specifically designed to 1) imprint the hatchery fish so that returning hatchery adults will spawn with the donor stock, and 2) minimize adverse interactions (i.e., competition for food and habitat) between hatchery-released and naturally produced smolts. All spring/summer chinook stocks are reared as yearlings to increase survival and reduce river residence time. The specific rearing and release strategies for each satellite facility are outlined below.

Chiwawa Spring Chinook: Transfer 700,000 subyearlings from Eastbank Hatchery to the Chiwawa Pond in September; rear and acclimate on parent river water to a size of approximately 12 fish/pound; allow fish to volitionally migrate in April-May.

Lake Wenatchee Sockeye: Transfer 230,000 fry from Eastbank Hatchery to the Lake Wenatchee net pens in March; rear fish to a size of approximately 24 fish/pound and release fish to the lake in October. The fish will reside in the lake for several months before migrating.

Wenatchee River Summer Chinook: Transfer 900,000 yearling fish from Eastbank Hatchery to Dryden Pond in February; rear and acclimate on parent river water to a size of approximately 12 fish/pound; allow fish to volitionally migrate in April-May.

Okanogan and Methow Summer Chinook: Transfer 600,000 subyearlings from Eastbank Hatchery to the Similkameen Pond in October; rear and acclimate on parent river water to a size of approximately 10 fish/pound; allow fish to volitionally migrate in April-May. Transfer 425,000 yearling fish from Eastbank Hatchery to the Methow Pond in February; rear and acclimate to parent river water until release. These fish are volitionally released in April-May at a size of 10 fish/pound.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

The hatchery practices established for broodstock selection and spawning are critical for maintaining the genetic diversity of each unique population or stock. Broodstock trapping is designed to remove representative members from the donor population in a random manner, and in a way to ensure that all segments (age and return timing) of the run are represented. The specific broodstock selection and spawning protocols for Rock Island Hatchery Complex are outlined below.

Chiwawa Spring Chinook: The trap used at Chiwawa serves three functions: 1) it collects all sizes and ages of returning adults, 2) it allows for segregation of hatchery- or natural-origin fish, and 3) when not collecting broodstock, the trap passes fish upstream with minimal delay. The broodstock selection strategy for Chiwawa spring chinook is to retain no more than 30 percent of the naturally produced adults returning to the river and pass all hatchery-origin fish upstream. The mating guidelines include the splitting of gametes of each sex into subsets for cross mating, spitting of eggs into sufficient numbers of subsets to accommodate 1:1 matings with males (particularly if there are more males), live spawning of individual males, and cryopreservation of milt for use in successive years.

Lake Wenatchee Sockeye: The strategy is to trap only enough adults to meet hatchery needs and spawn at 1:1 male-to-female ratio using two female and two male pools of gametes. Only Wenatchee River sockeye are used for broodstock.

Wenatchee River Summer Chinook: The broodstock section strategy is to collect only naturally produced salmon for broodstock. In 1992, both hatchery and wild fish were retained. The fish are spawned at a 1:1 male-to-female ratio. Gametes of the least numerous sex are split into subsets and these are crossed with gametes from a different individual of the more numerous sex. Males are also live-spawned when necessary.

Okanogan and Methow Summer Chinook: Broodstock collection for the Similkameen and Methow facilities is done concurrently with broodstock collection for the Wells Hatchery. Fish trapped at the east fishway of Wells Dam are used for the Similkameen and Methow programs, and fish volunteering into Wells Hatchery are used primarily for the Wells program although shortfalls in the Similkameen/ Methow needs can be made up with volunteer fish. To prevent inclusion of fall chinook stock into the summer chinook gene pool, broodstock collection at both capture sites is curtailed on August 28. Also, gametes from fish with coded-wire tags are held separately until the origin of fish is determined. Only summer chinook are used in these programs. A 1:1 mating scheme is employed.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural production. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.

- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows. Proper feeding practices are used to discourage over-feeding of the fish and over-accumulation of uneaten food or feces. Ponds or raceways are vacuumed to maintain cleanliness and reduce stress caused by other cleaning methods.

Fish Health Activities at Rock Island Hatchery Complex

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from spawned females (Chiwawa spring chinook,

Wenatchee sockeye, and Wenatchee, Similkameen and Methow summer chinook). ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult chinook are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per quarter on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to

coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

Evaluation Program

The first phase of the Rock Island Hatchery Complex evaluation program was implemented in 1992. Future areas of evaluation will be developed over time. Annual reports will include genetic monitoring results, disease history, survival estimates, pre-release physiology, and interactions with natural production at the time of fish release and during spawning when adults return.

PERFORMANCE STANDARDS—ROCK ISLAND HATCHERY COMPLEX

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	Chiwawa CHS	400	65	19-113 ¹	1
	Wenatchee CHR	512	275	81-491	1
	Wenatchee SOC	300	1,533	231-3,529	
	Similkameen CHR	400	N/A	N/A	1
	Methow CHR	291	N/A	N/A	1
Adult Prespawning Survival ²	Chiwawa CHS	80%	94.0%	73.7-100%	
	Wenatchee CHR	80%	90.0%	84.2-94.5%	
	Wenatchee SOC	80%	84.2%	55.0-99.1%	
	Similkameen CHR	80%	92.0%	N/A	
	Methow CHR	80%	92.0%	N/A	
Egg-take	Chiwawa CHS	830,000	107,995	45K-252K	1
	Wenatchee CHR	1,070,000	634,790	163K-1,134K	1
	Wenatchee SOC	250,000	237,226	139K-334K	
	Similkameen CHR	711,000	1,069,572 ³	940K-1,254K	1
	Methow CHR	525,000	1,069,572 ³	940K-1,254K	1
Green Egg-to-Fry Survival ²	Chiwawa CHS	90%	92.7%	88.0-97.1%	
	Wenatchee CHR	90%	81.7%	77.5-88.2%	2
	Wenatchee SOC	90%	85.0%	75.9-90.7%	
	Similkameen CHR	90%	84.9%	82.2-86.8%	2
	Methow CHR	90%	84.9%	82.2-86.8%	2
Fry-to-Smolt Survival ²	Chiwawa CHS	72%	96.5% ¹	96.0-98.0%	
	Wenatchee CHR	72%	98.1% ¹	97.6-98.5%	
	Wenatchee SOC	72%	96.4% ¹	92.5-99.0%	
	Similkameen CHR	72%	96.3% ¹	57.4-98.6%	3
	Methow CHR	72%	96.3% ¹	N/A	
Fish Releases	Chiwawa CHS	672,000	53,170 ¹		1,2
	Wenatchee CHR	864,000	422,200 ¹	124K-648K	1,2
	Wenatchee SOC	200,000	266,675 ¹	168K-372K	
	Similkameen CHR	576,000	447,300 ¹	353K-542K	1,2,3
	Methow CHR	400,000	0 ⁴	N/A	1,2
Transfers to Co-ops (Eggs/Fish)	Chiwawa CHS	0	--	--	
	Wenatchee CHR	0	--	--	
	Wenatchee SOC	0	--	--	
	Similkameen CHR	0	--	--	
	Methow CHR	0	--	--	

N/A=Not applicable.

¹ Data is based on five broods.

² Goals are assigned by FERC agreement and do not reflect hatchery expectations.

³ Three year average. Eggs are taken at Wells Hatchery.

⁴ First brood not yet released.

Objective 1 (continued)

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Other Transfers (Eggs/Fish)	Chiwawa CHS	0	--	--	
	Wenatchee CHR	0	--	--	
	Wenatchee SOC	0	--	--	
	Similkameen CHR	0	--	--	
	Methow CHR	0	--	--	
Adults Passed Upstream	Chiwawa CHS	--	19	One year only fish get by trap 31-3,296	
	Wenatchee CHR	--	--		
	Wenatchee SOC	--	1,265 ¹		
	Similkameen CHR	--	--		
	Methow CHR	--	--		
Percent Survival ²	Chiwawa CHS	0.26%	Unknown	Unknown	1,4
	Wenatchee CHR	0.23%	Unknown	Unknown	1,4
	Wenatchee SOC	0.90%	Unknown	Unknown	1,4
	Similkameen CHR	0.15%	Unknown	Unknown	1,4
	Methow CHR	0.15%	Unknown	Unknown	1,4

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	Chiwawa CHS	Yes	Unknown	4.4%	5
	Wenatchee CHR	Yes	Unknown	13.7%	5
	Wenatchee SOC	Yes	Unknown	N/A	5
	Similkameen CHR	Yes	Unknown	9.5%	5
	Methow CHR	Yes	Unknown	16.0%	5
Acclimation	Chiwawa CHS	Yes	N/A	N/A	
	Wenatchee CHR	Yes	N/A	N/A	
	Wenatchee SOC	No	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	
	Methow CHR	Yes	N/A	N/A	
Volitional Release	Chiwawa CHS	Yes	N/A	N/A	6
	Wenatchee CHR	Yes	N/A	N/A	6
	Wenatchee SOC	No	N/A	N/A	7
	Similkameen CHR	Yes	N/A	N/A	6
	Methow CHR	Yes	N/A	N/A	6

¹ First brood not yet released.

² Goals are assigned by FERC agreement and do not reflect hatchery expectations.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	Chiwawa CHS	Yes	N/A	N/A	1
	Wenatchee CHR	Yes	N/A	N/A	1
	Wenatchee SOC	Yes	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	
	Methow CHR	Yes	N/A	N/A	
Spawning Pop. >500	Chiwawa CHS	Yes	N/A	N/A	1
	Wenatchee CHR	Yes	N/A	N/A	1
	Wenatchee SOC	No	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	1
	Methow CHR	Yes	N/A	N/A	1
Spawning Ratio Male:Female	Chiwawa CHS	1:1	0.46:1	0.16:1 - 0.65:1	
	Wenatchee CHR	1:1	0.81:1	0.73:1 - 0.90:1	
	Wenatchee SOC	1:1	1.00:1	1.00:1	
	Similkameen CHR	1:1	0.76:1	0.65:1 - 1.00:1	
	Methow CHR	1:1	0.76:1	0.65:1 - 1.00:1	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	Chiwawa CHS	Yes	N/A	N/A	
	Wenatchee CHR	Yes	N/A	N/A	
	Wenatchee SOC	Yes	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	
	Methow CHR	Yes	N/A	N/A	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Eastbank Hatchery</u>	G	G				No adult returns to station
CHR/Wenatchee R			IHN	+		
CHR/Wells			IHN	+		
CHS/Chiwawa R			IHN	+		BKD by ELISA of broodstock
SOC/Lk Wenatchee			IHN	+		BKD by ELISA of broodstock
<u>Lk Wenatchee NP</u>	N/A	S				
SOC/Lk Wenatchee			IHN			
<u>Dryden RP</u>	N/A	SA				
CHR/Wenatchee R			IHN	+		
<u>Chiwawa RP</u>	N/A	SA				
CHS/Chiwawa			IHN	+		
<u>Similkameen RP</u>	N/A	SA				
CHS/Wells				+		No virus at pens; may have been progeny of IHN+ adults

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	
Develop and Review Comp. Basin-wide Production Plan	All	Yes	No	--	8
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Rock Island Hatchery Complex

1. Trap inefficiencies at some sites result in capturing inadequate numbers of broodstock, particularly during heavy spring runoff. This results in fish spawning upstream of the trap and prevents sampling of fish from the entire run. Poor survival of juveniles or adults may be caused by inadequate water flows, dam passage problems, higher reservoir water temperatures or predation in the reservoirs. Transporting adults to Eastbank may also increase mortality due to handling stress.
2. Softshell disease in eggs may reduce egg-to-fry survival. Unexplained poor fertilization occurs in some egg lots.
3. Thick ice or anchor ice at Similkameen rearing pond can restrict pond flows or kill fish directly.
4. Lack of current, continuous tag data. Only tagged fish are measured to determine mean length and coefficient of variation (CV).
5. Combining progeny of many egg-takes into single rearing ponds can cause size variations in the population. Dropout syndrome in some chinook stocks can also cause size variation problems.
6. Volitional release may be truncated if fish movement does not correspond with timing of water spills on the Columbia River.
7. Fish cannot be volitionally released from net pens. In addition, fish are not outmigrating when released. They reside in the lake over the winter and outmigrate the following spring.
8. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Elokomin Salmon Hatchery"}Elokomin Salmon Hatchery

INTRODUCTION

Elokomin Hatchery is located on the Elokomin River, 7 miles upstream from the river mouth. The Elokomin River is a north bank tributary of the lower Columbia River below Bonneville Dam. It enters the Columbia at river mile 38, just downstream of Cathlamet, Washington. It is staffed with 4.25 FTE's.

The facility consists of 20 raceways, 3 large ponds and a hatchery building with 6 shallow troughs, 2 deep troughs, 72 stacks of vertical incubators, and 18 freestyle incubators.

Water rights total 20,583 gpm from four sources: the Elokomin River, one well, a small, unnamed stream and Clear Creek. Well water is used for domestic use only. The Elokomin River supplies the majority (94 percent of average flow) of the water used for fish rearing. Water from Clear Creek and an unnamed stream is used for incubation. Actual water available to the hatchery averages 10,100 gpm (range: 8,310 gpm - 14,000 gpm).

Rearing Facilities at Elokomin Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs					12		Concrete	41	Good	
Vertical Incubators					576		Fiberglass	9	Good	
Pond 21				58,000	1	58,000	Earth	41	Poor	
Pond 22	160	100	4	64,000	1	64,000	Earth	41	Good	
Pond 23a	235	64	4	60,100	1	60,100	Asphalt	19	Good	Asphalted in 1981
Pond 23b	235	64	5	75,200	1	75,200	Asphalt	19	Good	Asphalted in 1981
Raceways	80	20	3	4,800	20	96,000	Concrete	41	Good	
Shallow Troughs					6		Concrete	41	Good	

PURPOSE

Elokomin Hatchery was authorized under the Mitchell Act and began operating in 1954 as part of the Columbia River Fisheries Development Program – a program to mitigate for fishery losses caused by human impacts such as hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is used for adult collection, egg incubation and rearing

of lower river fall chinook and coho (Type-S and Type-N). The hatchery is currently operating at maximum production. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries. Also provide steelhead and cutthroat rearing.

OBJECTIVES

Objective 1: Hatchery Production

Tule Fall Chinook

Produce 4 million subyearlings for on-station release.

Provide 325,000 eggs/fish to co-op programs.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-S Coho

Produce 500,000 yearlings for on-station release.

Type-N Coho

Produce 1,200,000 yearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Elokomín Hatchery is to collect as many adults as possible to maintain the hatchery production program and to provide for upstream escapement.

Tule Fall Chinook: Entry of adults into the subbasin occurs from early September to October. Spawning occurs from late September to early November with a peak usually in mid-October. Adults are captured in the lower Elokomín River at a temporary fish collection barrier, then hauled by truck upstream to the hatchery. Low stream flows in September and October prohibit adults from reaching the hatchery site. Production shortfalls are made up with imports from other hatcheries with excess eggs.

Type-S and Type-N Coho: Type-S coho begin entering the Elokomín River in early September. Spawning activity peaks in late October. Type-N coho begin entering the Elokomín River in late October and November. Peak spawning occurs in late November and early December. Adults are captured at a permanent fish collection barrier located at the hatchery site. Stocks are separated based on return timing. Type-S coho are the first to return. When the number of newly arriving adults decreases, the trap is temporarily closed and all captured adults are spawned. The trap is then re-opened and all adults entering after that date are considered Type-N stock. Production shortfalls are made up with imports from other hatcheries with excess eggs.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Tule Fall Chinook: Rear 4 million fish to a size of 50-80 fish/pound and release on-station into the Elokomin River (acclimated) in June.

Type-S Coho: Rear 500,000 fish to a size of 17 fish/pound and release on-station into the Elokomin River (acclimated) in May-June.

Type-N Coho: Rear 1,200,000 fish to a size of 17 fish/pound and release on-station into the Elokomin River (acclimated) in April-June. Some fish are volitionally released for two weeks before the space is needed for chinook rearing.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained. Any fin-marked fish or fish otherwise identified as non-Elokomin origin are not used in spawning.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. For these stocks, gametes are pooled and the effective male-to-female ratio may not be 1:1. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for use at the Elokomin Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Tule Fall Chinook

- 1 Elokomin fall chinook
- 1 Any other lower Columbia River tule stock

Historically, Kalama Falls and Spring Creek tule stocks have been major donor stocks for Elokomin. However, in each year, releases have included at least some progeny from adults returning to Elokomin hatchery.

Type-S (Early) Coho

- 1 Elokomin River Type-S
- 1 Any other Columbia River Type-S stock

All Type-S coho runs were started with Toutle River stock. Since the eruption of Mt. St. Helens, this stock has been maintained at Grays River Hatchery. Grays River has been the major donor since that time.

Type-N (Late) Coho

- 1 Elokomin River Type-N
- 2 Any other Columbia River Type-N stock

The Type-N coho run at Elokomin was started with both Elokomin and Cowlitz Hatchery Type-N stock.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fishery. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which

might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the

Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Elokomin Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and

Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—ELOKOMIN HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	2,500	1,669	662-3,677	1
	Type-S COH ¹	590	2,466	0-7,313	1
	Type-N COH	1,435	5,431	1,100-9,700	1
Adult Prespawning Survival	CHF	90%	72.4%	58.9-82.2%	2
	Type-S COH	90%	86.4%	78.7-93.6%	2
	Type-N COH	90%	92%	80.7-97.5%	2
Egg-take	CHF	5,000,000	2,723,734	1,125K-5,977K	
	Type-S COH ²	590,000	1,499,550	60K-3,340K	
	Type-N COH	1,435,000	1,921,453	779K-3,733K	
Green Egg-to-Fry Survival	CHF	90%	87.9%	79.3-95.3%	
	Type-S COH	90%	90.3% ³	83.2-96.4%	
	Type-N COH	90%	80.6%	64.6-91.1%	3
Fry-to-Smolt Survival	CHF	90%	98.2%	78.3-99.4%	
	Type-S COH ¹	90%	94.7% ⁴	89.9-97.7%	
	Type-N COH	90%	91.6%	85.0-98.1%	4
Fish Releases	CHF	4,000,000	3,967,439	1,840K-4,712K	1,2,3,4
	Type-S COH ⁵	500,000	568,187 ⁴	476K-636K	1,2,3,4
	Type-N COH	1,200,00	1,285,093	737K-1,687K	1,2,3,4
Transfers to Co-ops (Eggs/Fish)	CHF	325,000	124,000 ⁶	124,000	
	Type-S COH	0	111 ⁷	111	
	Type-N COH	0	102,600 ⁸	102,600	
Other Transfers (Eggs/Fish)	CHF	0-5,400,000	4,270K ⁶	4,270K	
	Type-S COH	0	--	--	
	Type-N COH	0-2,100,000	--	--	

N/A=Not applicable.

¹ Based on three broods only. In 1990, Type-S coho were combined with Type-N coho and could not be differentiated.

² Eggs taken from two broods only.

³ Average of two broods.

⁴ One brood only, 1988.

⁵ Based on three broods. Fish transferred from other hatcheries to make up shortfalls from insufficient egg-takes.

⁶ One year only, 1988.

⁷ One brood only, 1991.

⁸ One year only, 1989.

Objective 1 (continued)

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adults Passed Upstream	CHF	250	0	0	
	Type-S COH	500	3,941 ¹	3,941	
	Type-N COH	500	1,004	0-2,722	
Percent Survival	CHF	1.0%	Unknown	Unknown	5
	Type-S COH	3.0%	Unknown	Unknown	5
	Type-N COH	3.0%	2.89%	0.69-4.49%	5

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHF	Yes	6.5%	3.8-8.5%	
	Type-S COH	Yes	7.5%	7.2-10.1%	
	Type-N COH	Yes	7.5%	7.2-10.1%	
Acclimation	CHF	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	
Volitional Release	CHF	No	No	--	6
	Type-S COH	Yes	No	--	6
	Type-N COH	Yes	Partial	--	6

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHF	Yes	Yes	Yes	1
	Type-S COH	Yes	Yes	Yes	1
	Type-N COH	Yes	No	No	1
Spawning Pop. >500	CHF	Yes	Yes	Yes	
	Type-S COH	Yes	No	No	7
	Type-N COH	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHF	1:3 ²	0.9:1	0.8:1 - 1.0:1	
	Type-S COH	1:3 ²	0.8:1	0.5:1 - 1.1:1	
	Type-N COH	1:3 ²	0.90:1	0.7:1 - 1.1:1	

¹ One brood only, 1991.

² Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHF	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Elochoman Hatchery</u>	CS,SA	CS,SA				
CHF/Elochoman R				+		Reovirus
COH/Type-S			VHS			
COH/Type-N				+		
SCT/Elochoman R			IHN			
STS/Washougal R			IHN			
STW/Elochoman R			IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	8
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	9
Develop and Review Future Brood Doc.	All	Yes	Yes	--	8
Develop and Review Current Brood Doc.	All	Yes	Yes	--	8

Constraints/Comments—Elokomin Hatchery

1. Tule fall chinook and Type-N coho are not managed for escapement to individual hatcheries. Lack of adequate broodstock is made up by importing eggs from other facilities which have a surplus. The lower river trap captures non-tule stocks which must be removed from the population prior to spawning. In years when water flows are high, coho escape over the dam at the hatchery and are not captured. Survival of tule fall chinook has been low at this facility. Harvest and river flows can influence the sex ratio of returning adults.
2. Transportation of adults and the poorly designed holding pond (uses re-use water) increases stress on the adult fish and increases mortality. High water temperatures in the early fall increase the incidence of furunculosis disease.
3. Poor design of large rearing ponds (use of re-use water and poor flow characteristics) increases disease-related mortalities.
4. Lack of current, continuous tag data.
5. Designs of ponds 21 and 22 preclude use of volitional release until funding can be obtained to modify the outlet structures. Fish reared in pond 23 can be volitionally released for only two weeks before the pond space is needed to rear other species.
6. Type-S and Type-N coho cannot be held separately. Therefore, determining escapement and spawning of Type-S coho is difficult.

7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
8. A comprehensive basin-wide production plan has not been completed at this time.

Grays River Salmon Hatchery

INTRODUCTION

Grays River Hatchery is located at about river mile 2 of the West Fork Grays River, a lower Columbia River tributary. The Washington Department of Fisheries acquired the land on which hatchery is sited from the C.J. Schmond family. The buildings and hatchery facilities are owned by the federal government. John Hancock Pond, an off-station rearing site, was operated as a satellite facility in the past, but is currently not being used. The facility is staffed with 3.5 FTE's.

The facility includes 10 raceways, 1 earthen rearing pond, and 2 concrete adult-holding ponds (also used for juvenile rearing). Water rights total 22,488 gpm from three sources: the West Fork Grays River, an unnamed stream and wells. Most of the water is supplied by gravity flow from an intake located approximately 0.5 miles upstream from the hatchery. During the summer and fall months, virtually the entire river flow is diverted for hatchery use.

Rearing Facilities at Grays River Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs					32		Concrete	35	Fair	
Vertical Incubators					96		Fiberglass	18	Fair	
Raceways	80	20	4.5	5,275	10	52,750	Concrete	35	Poor	
Rear/Adult Pond	60	40	4.5	10,800	2	21,600	Concrete	35	Good	
Rearing Pond	200	55	4.5	49,500	1	49,500	Dirt	35	Poor	
Shallow Trough					1		Concrete	35	Fair	

PURPOSE

The hatchery was authorized under the Mitchell Act and began operating in 1961 as part of the Columbia River Fisheries Development Program—a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is used for adult collection, egg incubation, and rearing of lower river tule fall chinook, early (Type-S) coho, and winter and summer steelhead. The hatchery is currently operating at maximum production (based on deliverable water). Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with

insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce lower river fall chinook, coho, and steelhead that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Fall Chinook

Produce 1,200,000 subyearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-S Coho

Produce 150,000 yearlings for on-station release.

Produce 200,000 yearlings for release in Deep River from net pens.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Steelhead

Produce varying numbers of winter and summer steelhead yearlings for release in local streams

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Grays River Hatchery is to collect as many adults as possible to maintain the hatchery production program and to provide upstream escapement. Eggs from acceptable donor stocks are used to supplement hatchery shortfalls. Excess adults to hatchery needs are allowed to pass upstream for natural spawning.

Tule Fall Chinook: Adult fall chinook return in September and October. Spawning occurs from September to November. Adults are captured using a temporary weir located at the hatchery. Low river flows make it very difficult for adults to make it to the hatchery in many years.

Type-S Coho: Adult coho return in September and October. Spawning occurs from October to November with a peak in late October. Adults are also captured using a temporary weir located at the hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Tule Fall Chinook: Rear 1.2 million fish to a size of approximately 75 fish/pound and release on-station (acclimated) in late May or June. Rear 75,000 fish to a size of 25 fish/pound and release on-station (acclimated) in September or October.

Type-S Coho: Rear 350,000 fish to a size of 12-18 fish/pound; transport 200,000 to Deep River net pens for acclimation and release, acclimate remainder to parent river water for a minimum of six weeks; release one group of fish in April and the second group in May.

Winter and Summer Steelhead: Rear varying numbers to release size, release in local streams.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. For these situations, gametes are pooled and the effective male-to-female ratio may not be 1:1. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for use at the Grays River Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Tule Fall Chinook

1 Grays River fall chinook

1 Any lower Columbia River tule stock

Type S (Early) Coho

- 1 Grays River Type-S
- 2 Toutle River Type-S

The Type-S coho run was started with Toutle River stock.

Winter Steelhead

Summer Steelhead

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Grays River Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology

(WDOE). It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent / or influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September. This requirement may be waived by WDOE if no water violations occur.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September. This requirement may be waived by WDOE if no water violations occur.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current

management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—GRAYS RIVER HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	706	379	59-698	1
	Type-S COH	415	1,811	102-3,739	1
Adult Prespawning Survival	CHF	90%	91.1%	78.1-97.4%	2
	Type-S COH	90%	92.1%	87.0-98.1%	2
Egg-take	CHF	1,425,000	766,200	52K-31,646K	1
	Type-S COH	415,000	1,453,140	57K-3,282K	1
Green Egg-to-Fry Survival	CHF	90%	84.9%	72.6-93.7%	3
	Type-S COH	90%	93.6%	80.1-94.2%	3
Fry-to-Smolt Survival	CHF	90%	91.0%	78.1-100%	
	Type-S COH	90%	72.9% ¹	41.7-88.1%	
Fish Releases	CHF	1,200,000	847,700	159K-1,394K	1,5
	Type-S COH	350,000	246,395	132K-375K	1,5
Transfers to Co-ops (Eggs/Fish)	CHF	0	--	--	
	Type-S COH	0	34,300 ²	34,300	
Other Transfers (Eggs/Fish)	CHF	0-1,930,000	1,532,900 ³	1,532,900	
	Type-S COH	0-2,667,000	1,146,350 ¹	219K-2,256K	
	Type-S COH	200,000	200,000	200,000	
Adults Passed Upstream	CHF	50	30	0-118	1
	Type-S COH	150	321	0-1,526	1
Percent Survival	CHF	1.0%	0.76%	0.04-2.73%	4,6
	CHF (fall rel.)	2.5%	2.84%	0.49-2.96%	4,6
	Type-S COH	2.5%	1.71%	1.81-4.07%	4,6

N/A=Not applicable.

¹ Average of four broods, 1987-1990.

² One year only, 1989.

³ One year only, 1988.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts	CHF	Yes	8.6%	6.5-11.2%	7
CV<10%	Type-S COH	Yes	6.8%	6.5-7.0%	7
Acclimation	CHF	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	
	Type-S COH	Yes	No	--	8

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults	CHF	Yes	No	--	1
Throughout Run	Type-S COH	Yes	Yes	--	
Spawning Pop.	CHF	Yes	Yes	--	1
>500	Type-S COH	Yes	Yes	--	1
Spawning Ratio	CHF	1:3 ¹	0.7:1	0.6:1 - 0.8:1	1
Male:Female	Type-S COH	1:3 ¹	0.9:1	0.9:1 - 1.0:1	1

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to	CHF	Yes	Yes	--	3
Disease Policy	Type-S COH	Yes	Yes	--	3

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Grays River Hatchery</u>	G,SA	G,SA				
CHF/Grays R				+		Paramyxovirus
COH/Type-S				+		
STW/Elochoman R			IHN			
STS/Washoughal R			IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	9
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	9
Develop and Review Future Brood Doc.	All	Yes	Yes	--	10
Develop and Review Current Brood Doc.	All	Yes	Yes	--	9

Constraints/Comments—Grays River Hatchery

1. Tule fall chinook and Type-S coho are not managed for escapement to individual hatcheries. Lack of adequate broodstock is made up with importation of eggs from other facilities which have a surplus. Low river flows during the spawning migration coupled with no lower river weir prevents the hatchery from obtaining sufficient broodstock during years where adequate numbers of adult fish are present. However, coho returning during high water events may be able to bypass the temporary weir. Also, in some years there is low survival of chinook or coho from this facility. Harvest levels and migration impedance may result in unequal sex ratios at the hatchery.
2. Inadequate flows and high water temperatures in some years result in overcrowding and higher stress-related mortalities. Pipeline needs cleaning to remove the debris that is restricting water flow to the holding ponds. However, there has not been sufficient funds to accomplish this needed maintenance.
3. Because of funding shortfalls, a portion of the fall chinook has not been reared until fall for release. The fall releases have historically had the highest survival rates at this hatchery.
4. One of the large rearing ponds has a porous bottom which reduces the amount of rearing water. This creates increased rearing densities and higher mortalities.
5. Lack of current, continuous tag data to assess survival.

6. Combining progeny from more than one egg-take into a single rearing pond or disease problems during early rearing.
7. Design of rearing pond outlet structures is not conducive to volitional release.
8. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
9. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Kalama Falls Salmon Hatchery"}Kalama Falls Salmon Hatchery

INTRODUCTION

Kalama Falls Hatchery is located along the Kalama River at about river mile 10. The nearest town is Kalama, Washington located approximately 12 miles south of the hatchery. Site elevation is 100 feet above sea level. The facility is staffed with 5 FTE's.

The rearing units consist of 12 raceways and 6 rearing ponds. The rearing ponds are also used for holding adults. The fish ladder was originally constructed to pass fish around Kalama Falls, but was later modified to trap adults for the hatchery when the facility was built.

Adult fish cannot enter the adult holding ponds directly from the fishway. They are trapped and lifted into trucks and then transported to the holding ponds a few hundred feet away.

Facility water rights total 8,055 gpm from four sources: Kalama River, two unnamed creeks and a well (domestic water). The majority of water is supplied from the Kalama River with the two unnamed creeks providing seasonal water.

Rearing Facilities at Kalama Falls Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Vertical Incubators					960		Fiberglass		Good	
Raceways	80	20	3.5	5,600	12	67,200	Concrete	37	Fair	Some leaks
Rearing/ Adult Ponds	60	40	5	12,000	6	72,000	Concrete	37	Fair	Some leaks

PURPOSE

The hatchery was authorized under the Mitchell Act and began operating in 1958 as part of the Columbia River Fisheries Development Program – a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is used for adult collection, egg incubation and rearing of fall chinook, spring chinook and late (Type-N) coho. It has also been used in the past as an egg collection facility for early (Type-S) coho. The hatchery is currently operating at maximum production. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell

Act hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce lower river fall chinook, spring chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook

Produce 550,000 yearlings for transfer to the Lower Kalama Hatchery for extended rearing and release.

Pass 400 adult males upstream.

Fall Chinook

Produce 3,500,000 subyearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Pass 250 adults upstream for natural production.

Type-N Coho

Produce 900,000 yearlings for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Kalama Falls Hatchery is to collect as many adults as possible to maintain the hatchery production program and to provide for upstream escapement.

Spring Chinook: Adults are collected at the hatchery from May through September and are spawned from early September to early October.

Fall Chinook: Entry of adults into the Kalama River occurs from August to November. Spawning occurs from September to November with a peak in October. Most adults are captured at Modrow Trap in the lower Kalama River and trucked to the hatchery.

Type-N Coho: Type-N coho begin entering the Kalama River in late October and November. Peak spawning occurs in late November and early December. Adults are trapped at the hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the

hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook: Rear 550,000 fish to a size of 200 fish/pound and transfer to the Lower Kalama Hatchery in April-May for final rearing and release.

Fall Chinook: Rear 3.5 million fish to a size of 50-80 fish/pound and release on-station (acclimated) in June.

Type-N Coho: Rear 900,000 fish to a size of 17 fish/pound and release on-station (acclimated) in May.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for release from the Kalama Falls Hatchery are listed below.

Spring Chinook

Kalama Falls spring chinook

Fall Chinook

Kalama River fall chinook

Type-N Coho

Any Columbia River Type-N

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Kalama Falls Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult spring and fall chinook are injected with antibiotics for the control of bacterial diseases.

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—KALAMA FALLS HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	3,000	2,796	2,181-3,980	
	CHS	450	989	701-1,278	
	Type-S COH	N/A	1,871	294-4,877	
	Type-N COH	1,100	1,870	72-3,073	
Adult Prespawning Survival	CHF	90%	82.1%	65.7-92.2%	1
	CHS	90%	78.6%	60.9-91.8%	1
	Type-S COH	90%	90.1%	67.2-97.3%	
	Type-N COH	90%	97.1%	93.2-98.3%	
Egg-take	CHF	4,120,000	7,748,920	5,547K-11,306K	
	CHS	589,000	955,020	334K-1,352K	
	Type-S COH	N/A	466,620	32K-985K	
	Type-N COH	1,060,000	584,840	61K-1,251K	2
Green Egg-to-Fry Survival	CHF	90%	89.1%	87.8-91.6%	3
	CHS	90%	87.5%	82.1-87.5%	3
	Type-S COH	90%	96.6% ¹	96.6%	3
	Type-N COH	90%	89.2%	84.0-93.0%	
Fry-to-Smolt Survival	CHF	90%	95.9%	94.5-96.7%	
	CHS	90%	94.3% ²	90.3-96.6%	4
	Type-S COH	N/A	N/A	N/A	
	Type-N COH	90%	88.3%	83.6-93.4%	
Fish Releases	CHF	3,500,000	3,571,302 ³	3,538K-3,634K	
	CHS	-- ⁴	N/A	N/A	
	Type-S COH	-- ⁴	N/A	N/A	
	Type-N COH	900,000	616,560	342K-952K	2
Transfers to Co-ops (Eggs/Fish)	CHF	0	222,800 ⁵	222,800	
	CHS	0	--	--	
	Type-S COH	N/A	N/A	N/A	
	Type-N COH	0	--	--	
Other Transfers (Eggs/Fish)	CHF	500K-6,700K	3,361,640	1428K-6,595K	
	CHS	0	615,300	0K-1,140K	
	Type-S COH	N/A	415,900	32K-985K	
	Type-N COH	0	548,800 ⁵	548,800	

N/A=Not applicable.

¹ One year of data; eggs are shipped out.

² Three broods only; fish rearing was switched to Lower Kalama Hatchery.

³ On average, 202,680 fry are planted.

⁴ Transported and released at Lower Kalama Hatchery.

⁵ One year only.

Objective 1 (continued)

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adults Passed Upstream	CHF	250	171	0-435	1
	CHS	400	371	0-555 (males)	
	Type-S COH	N/A	558	0-1,778	
	Type-N COH	1,500	151	1-514	2
Percent Survival	CHF	1.0%	Unknown	Unknown	5
	CHS	5.0%	Unknown	Unknown	5
	Type-S COH	N/A	N/A	N/A	
	Type-N COH	5.0%	4.8%	1.1-6.9%	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHF	Yes	N/A	N/A	5
	CHS	N/A	N/A	N/A	5
	Type-S COH	Yes	N/A	N/A	5
	Type-N COH	Yes	N/A	N/A	5
Acclimation	CHF	Yes	Yes	--	
	CHS	N/A	N/A	N/A	
	Type-S COH	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	1
	CHS	N/A	N/A	N/A	
	Type-S COH	Yes	No	--	1
	Type-N COH	Yes	No	2 years	1

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults	CHF	Yes	Yes	Yes	1
Throughout Run	CHS	Yes	Yes	Yes	1
	Type-S COH	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Pop. >500	CHF	Yes	Yes	Yes	
	CHS	Yes	Yes	Yes	
	Type-S COH	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHF	1:3 ¹	0.63:1	0.33:1 - 0.89:1	
	CHS	1:1	0.93:1	0.72:1 -1.10:1	
	Type-S COH	1:3 ¹	0.90:1	0.70:1 -1.05:1	
	Type-N COH	1:3 ¹	1.50:1	0.49:1 - 3.70:1	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	All	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Kalama Fall Hatchery</u>	CS,SA	SA				
CHS/Kalama R				+		BKD by ELISA of broodstock
CHF/Kalama R						
COH/Type-N				+		
COH/Type-S			IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	6
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	7
Develop and Review Future Brood Doc.	All	Yes	Yes	--	6
Develop and Review Current Brood Doc.	All	Yes	Yes	--	6

Constraints/Comments—Kalama Falls Hatchery

1. Poorly designed rearing ponds are also used for adult holding. These ponds have poor water flow, poor circulation, and use 100 percent re-use water. During the summer and fall adult holding periods, the combination of poor design and warm water increases prespawning mortality of spring and fall chinook. This reduces the number of fish available for passage upstream and reduces egg availability from all run timing segments.
2. Because this station supplies tule fall chinook eggs to other hatcheries, increased mortality reduces the number of fish that can be passed upstream. During the spring juvenile rearing period, the poor water quality and inadequate flows reduce the hatchery production capacity. The existing pond design makes it difficult to use volitional release and there are currently no funds available to make improvements.
3. Columbia River Type-N coho are not managed to provide adequate escapement to the individual hatcheries.
4. Warm water during early incubation and muddy water during the fall rainy periods reduce the egg-to-fry survival of spring and fall chinook, and Type-S coho.
5. Transfer of juvenile spring chinook to Lower Kalama Hatchery results in additional stress on the fish.
6. Lack of current, continuous tag data. Only tagged fish are measured for mean length and coefficient of variation (CV).
7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
8. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Klickitat Salmon Hatchery"}Klickitat Salmon Hatchery

INTRODUCTION

Klickitat Hatchery is located in a remote area on the Klickitat River at river mile 42, near the town of Glenwood, Washington. The facility includes a hatchery building, 34 raceways (12 of which are hypalon-lined, above-ground raceways), an adult holding pond and 3 rearing/release ponds.

Water rights total 28,338 gpm from four sources: Indian Ford Springs, an unnamed spring (designated Indian Ford "B"), Wonder Springs and the Klickitat River. The facility is staffed with 5.25 FTE's.

Rearing Facilities at Klickitat Hatchery: _____e_____:

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Operation Plans for Anadromous Fish
Production Facilities in the Columbia River Basin Volume III – Washington Annual
Report 1995 Prepared by: Colville Confederated Tribes U.S. Fish and Wildlife
Service Washington Department of Fish and Wildlife Yakama Indian Nation Prepared
for: U.S. Department of Energy Bonneville Power Administration Division of Fish and
Wildlife P.O. Box 3621 Portland, OR 97283-3621 Project Number 92-043 Contract
Number DE-BJ79-91BP60629 June 1996

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Production Facilities in Washington viiiWashington Department of Fish and
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_Toc353704668 _3_ Chelan PUD Hatchery/Turtle Rock _GOTOBUTTON
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143 Lewis River and Speelyai Salmon Hatcheries _GOTOBUTTON
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Ferry Hatchery and Satellites _GOTOBUTTON _Toc353704680 _PAGEREF
_Toc353704680 _193_ Lyons Ferry Salmon Hatchery _GOTOBUTTON
_Toc353704681 _PAGEREF _Toc353704681 _207_ Merwin Dam Hatchery _
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_Toc353704692 _PAGEREF _Toc353704692 _359_ Wells Salmon Hatchery _
GOTOBUTTON _Toc353704693 _PAGEREF _Toc353704693 _371_ U.S. Fish and
Wildlife Service Hatchery Operation Plans 385 Abernathy Salmon Culture
Technology Center _GOTOBUTTON _Toc353704694 _PAGEREF _Toc353704694
387 Carson National Fish Hatchery _GOTOBUTTON _Toc353704695 _
PAGEREF _Toc353704695 _401_ Entiat National Fish Hatchery _duced fish.
Fish are reared to sufficient size that smoltification occurs within nearly the entire

population, which will reduce retention time in downstream migration. When possible, rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

URB Fall Chinook: Rear to a size of 80 fish/ pound and release at the hatchery in May-June. For the past two years, approximately 45 percent of the fall chinook production has had exposure to partial river water for three weeks or more prior to release. This acclimation will likely continue in the years ahead.

Type-N Coho: Rear 1,350,000 fish to a size of 20 fish/ pound and volitionally release at the hatchery in April-June. Fish are acclimated to parent river water for six months or more prior to release.

Spring Chinook: Rear 1,200,000 fish to a size of 50 fish/ pound and release into the upper Klickitat River in June. Rear 600,000 fish to a size of 7-10 fish/ pound and release at the hatchery in March-May. A portion of the releases is acclimated to parent river water for 3-6 weeks as part of an experiment. Program changes can be made to acclimate up to 50 percent of the programmed production if the experiment demonstrates that fish survival is enhanced.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/ fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for release from the Klickitat Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Fall Chinook

- 1 Upriver bright (Priest Rapids fall chinook)
- 2 Mid-Columbia River, Snake River mix fall chinook

Type-N (Late) Coho

- 1 Any Columbia River Type-N coho

Spring Chinook

- 1 Klickitat River spring chinook

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Klickitat Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.
- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from all spring chinook females. ELISA is used to

detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.

- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group

meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual

production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—CLICKITAT HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	2,500	39	0-41	1
	CHS	1,060	767	215-1,782	
	Type-N COH	1,600	0	0	1
Adult Prespawning Survival	CHF	90%	68.9%	67.4-70.3%	1
	CHS	90%	92.3%	75.0-98.6%	
	Type-N COH	90%	0	0	1
Egg-take	CHF	5,000,000	21,115	0-78K	1
	CHS	2,120,000	1,181,140	373K-2,400K	
	Type-N COH	1,600,000	0	0	1
Green Egg-to-Fry Survival	CHF	90%	86.7%	80.1-98.9%	3
	CHS	90%	92.9%	88.6-95.6%	
	Type-N COH	90%	95.2%	88.2-100%	3
Fry-to-Smolt Survival	CHF	90%	97.6%	95.7-98.6%	3
	CHS	90%	90.8%	88.0-97.3%	
	Type-N COH	90%	77.0%	72.4-82.9%	3
Fish Releases	CHF	4,000,000	4,295,760	4,152K-4,463K	3
	CHS	600,000	635,580	311K-783K	
	Type-N COH	1,350,000	1,176,000	950K-1,360K	3
Transfers to Co-ops (Eggs/Fish)	CHF	0	--	--	
	CHS	0	--	--	
	Type-N COH	0	500	500	
Other Transfers (Eggs/Fish)	CHF	0	--	--	
	CHS	1,200,000 ¹	1,197,800 ²	1,197,800	
	Type-N COH	0	--	--	
Adults Passed Upstream	CHF	0	0	0	1
	CHS	0	505 ³	0-505	2
	Type-N COH	0	0	0	1
Percent Survival	CHF	1.0%	Unknown	Unknown	4
	CHS	2.5%	Unknown	Unknown	4
	Type-N COH	3.0%	Unknown	Unknown	4

N/A=Not applicable.

¹ Klickitat River programmed fingerling production; usually not achieved.

² One brood only, 1988.

³ One brood only, 1993.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHF	Yes	N/A	N/A	5
	CHS	Yes	N/A	N/A	5
	Type-N COH	Yes	N/A	N/A	5
Acclimation	CHF	Yes	Partial	--	6
	CHS	Yes	Experimental/Partial	--	6
	Type-N COH	Yes	Yes	--	
Volitional Release	CHF	No	No	--	6
	CHS	Partial	Partial	--	6
	Type-N COH	Yes	Yes	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHF	Yes	No	No	
	CHS	Yes	Yes	Yes	
	Type-N COH	Yes	No	No	1
Spawning Pop. >500	CHF	Yes	No	No	1
	CHS	Yes	Yes	Yes	1
	Type-N COH	Yes	No	No	1
Spawning Ratio Male:Female	CHF	1:3 ¹	1:1:1	1:1:1	
	CHS	1:3 ¹	0.8:1	0.62:1 - 1:1	
	Type-N COH	1:3 ¹	No adults	No adults	1

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHF	Yes	Yes	--	
	CHS	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u> <u>Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./</u> <u>ERM</u>	<u>Other/Comments</u>
<u>Klickitat Hatchery</u>	G	G,SA				
CHS/Klickitat R			IHN	+		
CHF/URB				+		
COH/Type-N				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	8
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	8
Develop and Review Future Brood Doc.	All	Yes	No	--	9
Develop and Review Current Brood Doc.	All	Yes	No	--	8

Constraints/Comments—Klickitat Hatchery

1. Both URB fall chinook and Type-N coho fisheries are not managed to provide adequate escapement to this hatchery. Egg shortfalls are made up by importing eggs from other hatcheries that have surplus eggs. Because of inadequate adult returns to the hatchery, fish are not passed upstream.
2. Poor survival has reduced the number of returning adults. This poor survival may be the result of 1) rearing fish in spring water (which delays the migratory response), 2) mortality associated with passage over one dam, or 3) mortality associated with bacterial kidney disease.
3. Eggs are imported from either Priest Rapids or Lyons Ferry hatcheries. Eggs from Lyons Ferry hatchery suffer from softshell disease.
4. Lack of current and continuous tag data.
5. Ponding of progeny from numerous egg-takes into single ponds can cause size variations. Rearing of fish in warm spring water causes fast growth rates which requires feeding at ration levels that are too low to promote keeping fish in-size.
6. Use of spring water to rear fish does not promote a strong migratory response in smolts. Therefore, it does not promote volitional release. Without acclimation to ambient river water, the migratory urge is reduced and fish survival may decrease.

7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
8. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Lewis River and Speelyai Salmon Hatcheries"}Lewis River and Speelyai Salmon Hatcheries

INTRODUCTION

Lewis River Hatchery is located adjacent to the Lewis River, 3 miles downstream from Merwin Dam, about 8 miles east of Woodland, Washington. Elevation of the facility is 64 feet above sea level.

The hatchery began operation in 1932. Currently 66 percent of the funding is provided by PacifiCorp and 34 percent NMFS-Mitchell Act. Budgets at these facilities are a mixture of PacifiCorp and state and federal funds. The facility is staffed with 5.5 FTE's which is shared with Speelyai Hatchery. This staffing level changes in response to budgetary changes.

Rearing units consist of 12 raceways and four 0.5-acre ponds. Facility water rights total 38,613 gpm from three sources: the Lewis River, an unnamed stream and Colvin Creek. Only the Lewis River is currently used for hatchery operations.

Speelyai Hatchery is operated as a satellite facility to the Lewis River Hatchery. It is located in a mountainous area at the upper end of Lake Merwin on the Lewis River, approximately 21 miles east of Woodland. Site elevation is approximately 500 feet above sea level.

Rearing Facilities at Lewis River and Speelyai Hatcheries

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
0.5-acre Ponds				90,000	2	180,000	Concrete		Good	
0.5-acre Ponds				80,000	2	160,000	Concrete		Good	
Deep Troughs					5		Plastic	13	Good	
Vertical Incubators					800		Fiberglass	13	Good	FAL
Raceways	100	10	4	4,000	12	48,000	Concrete	12	Good	
Adult Holding	100	40	4.5	18,000	1	18,000	Asphalt	13	Fair	
Deep Trough					1		Plastic		Good	
Vertical Incubators					500		Fiberglass	11	Good	FAL
Raceways	80	20	4.5	7,200	12	86,400	Concrete	26	Fair	
Rearing Pond				18,000	1	18,000	Asphalt	13	Fair	

Speelyai began operation in 1954 and is owned and funded jointly by PP&L and Cowlitz County PUD. The facility has 12 concrete raceways, a 0.14-acre rearing pond, and an adult holding pond (also used to rear fish). It is staffed with 3.2 FTE's which is shared with Lewis River Hatchery when needed. Water rights total 6,732 gpm from Speelyai Creek. All raceways and ponds receive single-pass water.

PURPOSE

Lewis River and Speelyai hatcheries were originally constructed to provide mitigation for hydroelectric system development in the Lewis River System. An almost total remodel and upgrade of all rearing ponds and infrastructure at Lewis River Hatchery was funded with state enhancement funds in 1979 and 1980. The Lewis River Hatchery is used for adult collection, egg incubation and rearing of early (Type-S) and late (Type-N) coho as well as spring chinook. Lewis River also final rears a component of spring chinook from Speelyai for three months. Speelyai Hatchery is used for adult holding, egg incubation and rearing of spring chinook and Type-N coho. All stocks are managed to provide adequate escapement to the hatcheries for future brood needs.

GOALS

Produce adult coho and spring chinook that will contribute to NE Pacific and Columbia River Basin sport and commercial fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Lewis River Hatchery

Produce 900,000 yearling spring chinook for on-station release.

Produce 2,100,000 yearling Type-N coho for on-station release.

Produce 1,400,000 yearling Type-S coho for on-station release.

Produce 1,000,000 yearling Type-S coho for upriver release.

Produce 870,000 yearling Type-S coho (from Speelyai) for on-station release.

Provide 14,000 Type-S coho eggs/ fish to co-op programs.

Provide 50,000 yearling Type-N coho to co-op programs.

Provide Type-N and Type-S coho eggs/ fish (surplus to on-station needs) to other facilities.

Speelyai Hatchery

Rear 315,000 spring chinook yearlings for transfer to the Lewis River Hatchery.

Produce 200,000 Type-S coho yearlings for release into Lake Merwin.

Provide 31,000 Type-S coho eggs/ fish to co-op programs.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lewis River Hatchery is to collect as many adults as possible to maintain the hatchery production/mitigation program.

Spring Chinook: Adults return to the hatchery and are also trapped at Merwin Dam. Fish are trapped from April to July. They are sorted, inoculated and then transported to Speelyai Hatchery for holding and spawning.

Type-S Coho: Adults return to the hatchery from mid-September to first of November with peak spawning in late October.

Type-N Coho: Adults return to the hatchery from mid-October to late December with peak spawning in early December.

Both early and late coho return to the hatchery or are trapped at Merwin Dam.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook

- Incubate eggs at Speelyai and transfer 930,000 fish to the Lewis River Hatchery in April. Rear these fish to a size of 5 fish/pound and volitionally release on-station (acclimated) in March the following year.
- Keep approximately 315,000 fish at Speelyai; rear to a size of 10 fish/pound and transfer to Lewis River Hatchery in early January.

Type-S Coho

- Incubate all early coho eggs at Speelyai until eyed and then ship to Lewis River Hatchery. Rear 200,000 fish to a size of 15 fish/pound and release into Lake Merwin in June the following year.
- Rear 2,400,000 coho at Lewis River till near yearling stage. Transfer 1,000,000 in February-March to upriver acclimation/release site. Release remaining 1,400,000 in April-June.

Type-N Coho: Rear 3,552,000 fish at Lewis River Hatchery to a size 17 fish/pound; volitionally release on-station (acclimated) in April-June.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for release from the Lewis River and Speelyai hatcheries have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Spring Chinook

- 1 Lewis River spring chinook
- 2 Cowlitz River spring chinook
- 2 Kalama River spring chinook

Type-S Coho

- 1 Lewis River Type-S
- 2 Any Columbia River Type-S

Type-N Coho

- 1 Lewis River Type-N
- 2 Any Columbia River Type-N

Fall Chinook

- 1 Lewis River fall chinook

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on

historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Lewis/Speelyai Hatcheries

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook and Type-S coho are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps

identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group

meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual

production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—LEWIS RIVER/SPEELYAI HATCHERIES

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHS	618	640	393-794	1
	Type-S COH	1,950	11,208	3,388-29,561	
	Type-N COH	5,205	25,655	8,719-46,220	
Adult Prespawning Survival	CHS	90%	83.4%	78.7-86.9%	2
	Type-S COH ¹	90%	93.1%	87.9-98.2%	
	Type-N COH	90%	97.5%	95.8-99.3%	
Egg-take	CHS	1,600,000	1,393,490	757K-1,736K	3
	Type-S COH	1,950,000	1,958,300	1,407K-3,013K	
	Type-N COH	5,205,000	11,524,120	10,407K-13,097K	
Green Egg-to-Fry Survival	CHS	90%	83.7%	80.1-91.2%	2
	Type-S COH	90%	79.6%	66.4-86.7%	2
	Type-N COH	90%	92.3%	89.1-94.3%	
Fry-to-Smolt Survival	CHS	90%	95.0%	88.3-97.2%	
	Type-S COH	90%	96.2%	87.0-99.6%	
	Type-N COH	90%	91.9%	86.6-95.1%	
Fish Releases	CHS ¹	1,215,000	873,512	389-1,244K	1,2,4
	Type-S COH ¹	1,400,000 ²	1,085,400 ³	839-1,214K	
	Type-N COH ¹	2,100,000 ⁴	3,094,780	869-4,542K	
Transfers to Co-ops (Eggs/Fish)	CHS	0	--	--	
	Type-S COH	32,000	30,650 ⁵	30,650	
	Type-N COH	0	5,400 ⁶	5,400	
Other Transfers (Eggs/Fish)	CHS	0	--	--	
	Type-S COH	1,300,000 ⁷	947,425 ⁸	687K-1,112K	
	Type-N COH	0-1,000,000	3,443,742 ⁹	1,766K-6,735K	

N/A=Not applicable.

¹ Combined totals for Lewis River and Speelyai hatcheries.

² 1992 Type-S coho planting goal reduced to 870,000.

³ An additional average of 817,450 Type-S coho are planted into Lake Merwin from Speelyai Hatchery.

⁴ 1992 Type-N coho planting goal reduced to 3,552,000.

⁵ Two years data, 1989 and 1990.

⁶ One year only, 1990.

⁷ Transferred to Lake Merwin.

⁸ From Speelyai Hatchery only.

⁹ Most are egg transfers to other stations.

Objective 1 (continued)

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adults Passed Upstream	CHS	0	0	0	
	Type-S COH	0	4,847	0-20,306	
	Type-N COH	0	6,800	0-25,125	
Percent Survival	CHS	2.5%	Unknown	Unknown	5
	Type-S COH	2.5%	5.0%	4.2-5.4% ¹	
	Type-N COH	2.5%	8.0%	7.1-8.8% ¹	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHS	Yes	15.0%	12.0-19.0%	6
	Type-S COH	Yes	6.8%	4.8-8.7%	6
	Type-N COH	Yes	6.9%	4.5-9.0%	6
Acclimation	CHS	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	
Volitional Release	CHS	Partial	Partial	--	7
	Type-S COH	Partial	Partial	--	
	Type-N COH	Partial	Partial	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHS	Yes	Yes	Yes	1
	Type-S COH	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Pop. >500	CHS	Yes	Yes	Yes	
	Type-S COH	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHS	1:3 ²	0.6:1	1.2:1 - .5:1	
	Type-S COH	1:3 ²	0.8:1	0.4:1 - 1.3:1	
	Type-N COH	1:3 ²	0.8:1	1:1 - 0.6:1	

¹ Data is based on two broods.

² Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHS	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Lewis River Hatchery</u>	SA	SA				
CHS/Lewis R			IHN	+		IHN in yearlings
COH/Type-N				+		
COH/Type-S				+		
<u>Speelyai Hatchery</u>	SR	SR				
CHS/Lewis R			IHN	+		
COH/Type-S				+		
CHS/Kalama R			IHN			Adults transferred from Kalama R

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	8
TSS Max Effluent	All	15 mg/L	N/A	N/A	8
SS Effluent	All	0.1 ml/L	N/A	N/A	8
TSS PA Effluent	All	100 mg/L	N/A	N/A	8
SS PA Effluent	All	1.0 ml/L	N/A	N/A	8
Downstream Temp	All	Varies	N/A	N/A	8
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	9
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	10
Develop and Review Future Brood Doc.	All	Yes	Yes	--	9
Develop and Review Current Brood Doc.	All	Yes	Yes	--	9

Constraints/Comments—Lewis River/Speelyai Hatcheries

1. Mouth of the fish ladder needs to be dredged because shallow bar area discourages spring chinook from entering the ladder. In addition, spring chinook are not well attracted to the ladder mouth because they were reared on a different water source.
2. High water temperatures during the fall causes increased mortality of spring chinook and Type-S coho. It also increases egg mortality from adults held in warm water for long periods of time. Hauling of spring chinook to Speelyai Hatchery increases stress and mortality, but decreases subsequent adult and egg mortality.
3. Lack of sufficient brood due to poor survival years or high harvest rates in the Columbia River commercial fisheries. Higher survival of male fish can skew the sex ratio of returning adult, thus making it difficult to obtain adequate number of eggs.
4. Low flows can reduce production capability and increase loadings in Davis Creek pond.
5. Lack of continuous, current tag data.
6. Combining progeny of many different egg-takes increases size variation in the large rearing ponds.

7. Location of Speelyai Hatchery precludes volitional release.
8. Pollution abatement pond is too small to accommodate the hatchery cleaning schedule, particularly for the large rearing ponds. In addition, the Davis Creek pond is not plumbed into the abatement pond. As a result, this hatchery is in frequent violation of the pollution abatement requirement. An abatement pond is in the planning stage at Speelyai Hatchery.
9. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
10. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Lower Kalama Salmon Hatchery"}Lower Kalama Salmon Hatchery

INTRODUCTION

Lower Kalama Hatchery is located along the Kalama River, 5 miles north of Kalama, Washington. The facility is 53 feet above sea level and is located in relatively steep terrain. It is staffed with 3.25 FTE's.

The rearing units consist of 8 raceways, 1 asphalt rearing pond (also used for adult holding), and 1 gravel rearing pond. Total rearing area is 161,200 cubic feet.

Facility water rights total 15,112 gpm from two sources: Kalama River and Fallert Creek. The hatchery water supply comes from the Kalama River by pumping and from Fallert Creek by gravity flow.

Water from Fallert Creek is used for incubation and some fish rearing. This creek is not used during summer months because of low water flows.

Rearing Facilities at Lower Kalama Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs					4		Concrete	46	Good	
Vertical Incubators					304		Fiberglass	10	Good	FAL
Vertical Incubators					144		Fiberglass	26	Fair	Heath
Gravel Pond				55,000	1	55,000	Dirt		Poor	
Raceways	80	20	4	6,400	8	51,200	Concrete	35	Good	
Rearing/ Adult Pond				55,000	1	55,000	Asphalt	35	Fair	
Shallow Troughs					16		Concrete	46	Good	

PURPOSE

Lower Kalama Hatchery began operation in 1895 and is one of the oldest hatcheries in the Columbia River Basin. Facility operations are funded as part of the Mitchell Act—a program to mitigate for fishery losses caused by hydroelectric system development. Funds for this program are administered by the National Marine Fisheries Service.

This facility is used for spawning, egg incubation, and rearing of tule fall chinook and early (Type-S) coho. It is also used for final rearing and release of yearling spring chinook transferred in from the Kalama Falls Hatchery. The hatchery is currently operating at maximum production. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs (see Kalama Falls Hatchery Plan).

GOALS

Produce lower river fall chinook, spring chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook

Produce 500,000 yearlings for on-station release.

Fall Chinook

Produce 2,000,000 subyearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-S Coho

Produce 525,000 yearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lower Kalama Hatchery is to collect as many adults as possible to maintain the hatchery production program.

Spring Chinook: There is no adult spring chinook collection program at this hatchery. Spring chinook are transferred from the Kalama Falls Hatchery as fingerlings.

Tule Fall Chinook: Entry of adults into the subbasin occurs from August to November. Spawning occurs from September to November with a peak in October. Adults are captured at Modrow Trap in the lower Kalama River and trucked to Kalama Falls Hatchery. When the holding ponds at Kalama Falls are full, Lower Kalama Hatchery becomes the alternate location for holding adults. Adults also return to Fallert Creek, which supplies additional eggs for the hatchery.

Type-S Coho: Type-S coho begin entering the Kalama River in September. Spawning occurs from October to November with a peak in late October to early November. Adults are captured at the hatchery site as they migrate up Fallert Creek.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook: Rear 500,000 fish to a size of 7 fish/ pound and release on-station (acclimated) in April.

Fall Chinook: Rear 2 million fish to a size of 50-80 fish/ pound and release on-station (acclimated) in June.

Type-S Coho: Rear 525,000 fish to a size of 18 fish/ pound and release on-station (acclimated) in May.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/ fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for release from the Lower Kalama Hatchery are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Spring Chinook

- 1 Kalama Falls spring chinook

Fall Chinook

- 1 Kalama River fall chinook

Type-S Coho

- 1 Grays River Type-S
- 2 Toutle River Type-S

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Lower Kalama Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by steam flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—LOWER KALAMA HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	1,425	1,394	887-1,899	1
	Type-S COH	880	1,869	474-4,262	
Adult Prespawning Survival	CHF	90%	84.3%	71.9-89.2%	2
	Type-S COH	90%	98.1%	95.8-100%	
Egg-take	CHF	2,360,000	2,897,860	827K-4,231K	
	Type-S COH	1,200,000	1,858,800	252K-3,834K	
Green Egg-to-Fry Survival	CHF	90%	92.9%	89.9-94.6%	2
	Type-S COH	90%	89.6%	79.4-96.6%	
Fry-to-Smolt Survival	CHF	90%	99.5%	99.2-99.7%	
	Type-S COH	90%	95.4%	92.3-98.0%	
Fish Releases	CHF	2,000,000	2,149,981	2,040K-2,242K	1
	CHS	500,000	491,050	282K-572K	
	Type-S COH	525,000	475,346	209-554K	
Transfers to Co-ops (Eggs/Fish)	CHF	0	700,000 ¹	--	
	CHS	0	--	--	
	Type-S COH	0	550,000 ²	--	
Other Transfers (Eggs/Fish)	CHF	0-1,500,000	1,025,000 ³	--	
	CHS	0	435,694 ⁴	--	
	Type-S COH	550,000 ⁵	--	270K-1,200K	
Adults Passed Upstream	CHF	0	0	0	1
	CHS	0	0	0	
	Type-S COH	0	89	0-211	
Percent Survival	CHF	1.0%	Unknown	Unknown	3
	CHS	5.0%	Unknown	Unknown	3
	Type-S COH	3.0%	Unknown	Unknown	3

N/A=Not applicable.

¹ One year only, 1987.

² One year only (1990, egg transfer).

³ Two years only (egg transfers).

⁴ Three years of egg transfers and two years of fish transfers.

⁵ Rocky Reach program.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts	CHF	Yes	N/A	N/A	3
CV<10%	CHS	Yes	N/A	N/A	3
	Type-S COH	Yes	N/A	N/A	3
Acclimation	CHF	Yes	Yes	--	
	CHS	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	4
	CHS	Yes	No	--	4
	Type-S COH	Yes	No	--	4

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults	CHF	Yes	No	--	1
Throughout Run	Type-S COH	Yes	Yes	--	
Spawning Pop.	CHF	Yes	Yes	600-2,400	
>500	Type-S COH	Yes	Yes	15-4,000	
Spawning Ratio	CHF	1:1	1.3:1	0.5:1 - 3.6:1	
Male:Female	Type-S COH	1:3 ¹	1.1:1	0.7:1 - 1.4:1	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to	CHF	Yes	Yes	--	
Disease Policy	Type-S COH	Yes	Yes	--	

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u> <u>Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./</u> <u>ERM</u>	<u>Other/Comments</u>
<u>Fallert Creek Hatchery</u>	SA	SA				
CHS/Kalama R				+		
CHF/Kalama R				+		
COH/Type-S				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	5
TSS Max Effluent	All	15 mg/L	N/A	N/A	5
SS Effluent	All	0.1 ml/L	N/A	N/A	5
TSS PA Effluent	All	100 mg/L	N/A	N/A	5
SS PA Effluent	All	1.0 ml/L	N/A	N/A	5
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	- -	6
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	- -	7
Develop and Review Future Brood Doc.	All	Yes	Yes	- -	6
Develop and Review Current Brood Doc.	All	Yes	Yes	- -	6

Constraints/Comments—Lower Kalama Hatchery

1. Kalama River tule fall chinook are managed to provide adequate escapement to the Kalama hatcheries because these hatcheries provide eggs to other lower Columbia River hatcheries with shortfalls. Type-S coho are not managed to provide adequate escapement to the hatchery. Because of the lower river trap at Modrow, this facility does not receive tule fall chinook from all segments of the run.
2. Hauling fish increases prespawning mortality, particularly during years when high water temperatures are present. High water temperatures during holding increases the egg-to-fry mortality, particularly with Type-S coho.
3. Lack of current, continuous tag data. Only marked fish are measured to determine mean length and coefficient of variation (CV).
4. Outlet structures on rearing ponds are not designed to allow volitional release.
5. There is no pollution abatement pond; effluent discharges into Fallert Creek. The hatchery has been in violation of water quality standards during pond drawdowns. Funds are not currently available for construction of an abatement pond.
6. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

7. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Lyons Ferry Hatchery"}Lyons Ferry Hatchery and Satellites (Tucannon Hatchery and Curl Lake, Cottonwood, and Dayton Rearing Ponds)

INTRODUCTION

Lyons Ferry Hatchery is located on the Snake River above Lower Monumental Dam near Starbuck, Washington. Site elevation is 526 feet above sea level. The WDFW hatchery is staffed with 6.5 FTE's. Rearing facilities at Lyons Ferry Hatchery include 19 raceways, 3 earthen rearing ponds, adult holding ponds, and a hatchery building with 60 troughs. Water rights total 53,200 gpm from wells. A constant 22,100 gpm is available for use at the WDFW hatchery.

Four satellite facilities are operated as part of the Lyons Ferry Hatchery complex: Tucannon Hatchery, Curl Lake Rearing Pond, Cottonwood Rearing Pond and Dayton Rearing Pond. Tucannon Hatchery is located on the Tucannon River, 2 miles east of Dayton, Washington. This hatchery rears resident rainbow trout.

Cottonwood Rearing Pond is located at river mile 28 on the Grande Ronde River. This 1.25-acre pond was constructed in 1984. Water rights total 2,693 gpm from Cottonwood Creek and ranges from 2,693 gpm in March to 1,795 gpm in May.

Curl Lake Rearing Pond is located on the Tucannon River. This 2.8-acre pond was constructed in 1984. Water rights total 2,693 gpm from the Tucannon River, but up to 4,488 gpm have been used.

Dayton Rearing Pond is located on the Touchet River (Walla Walla River tributary) in Dayton, Washington. This 0.8-acre pond began operation 1987. Water rights total 2,693 gpm from the Touchet River, which is the amount used.

Rearing Facilities at Lyons Ferry Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
2-acre Ponds	1,100	78	7.2	618,000	3	1,854,000	Earth/Concrete	13	Good	
Adult Raceways	84.4	10	5	4,221	3	12,663	Concrete	13	Good	
Buckets					192		Plastic	13	Good	
Intermediate Rwys	27.6	3.8	2	211	4	844	Concrete	13	Good	
Production Rwys	88.5	9.7	3.3	2,873	19	54,587	Concrete	13	Good	
Troughs	14.4	1	.5	7	88	634	Concrete	13	Good	

PURPOSE

Lyons Ferry Hatchery was built by the U.S. Army Corps of Engineers in 1982 as part of the Lower Snake River Compensation Program—a program to mitigate for fishery losses caused by the four dams constructed on the lower Snake River. The USFWS provides operating funds to the hatchery, while WDFW operates the facility. Lyons Ferry is used for rearing rainbow trout and for adult collection, egg incubation and rearing of summer steelhead. The satellite facilities are used to acclimate pre-smolts to the parent river water for several weeks prior to their release.

GOALS

Summer Steelhead: Produce fish for sport and tribal fisheries while providing adequate escapement for hatchery production.

Rainbow Trout: Produce fish for sport fisheries.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead

Produce 875,000 summer steelhead smolts for on-station release and for release from satellite facilities.

Rainbow Trout

Produce 253,000 legal-sized fish and 200,000 sub-legal fish for release into numerous lakes, ponds and streams.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report.

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lyons Ferry Hatchery is to collect enough adults to maintain the hatchery production program. Hatchery steelhead enter the hatchery trap from August through mid-December with a peak in late September. Fish are spawned from late January through mid-March with over 90 percent of the spawning completed by early March.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Lyons Ferry Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Summer Steelhead: The current strategy is to rear 70,000 summer steelhead smolts to a size of 4-8 fish/pound and release on-station between April 15 and May 15. The remaining fish are released off-station at the following sites:

Tucannon River	80,000
Walla Walla River	200,000
Mill Creek	30,000
Wildcat Creek	50,000

In addition, satellite facilities are used to acclimate smolts for a period of two months prior to release. The fish releases from these acclimation sites are as follows:

Curl Lake Rearing Pond	120,000
Dayton Pond	150,000
Cottonwood Pond	175,000

All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adult summer steelhead are collected from August through mid-November and spawned between February and early March. Two and sometimes three stocks are used – Lyons Ferry, Wallowa and Oxbow. Lyons Ferry broodstock is collected at the hatchery while Wallowa is collected on the Grande Ronde. Oxbow fish originate from the Touchet/Walla Walla system. Progeny from the above are returned to the system of origin.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults and spawn fish at a 1:1 male-to-female ratio. Most egg-takes are used in hatchery production.

Acceptable Stocks

Importing eggs from other facilities with acceptable stocks is occasionally done in emergencies when disease epizootics occur. Other stocks used include Pahsimeroi and Wells. Although these latter stocks are less desirable than Lyons Ferry and Wallowa, they are upper Columbia River and Snake River stocks.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.

- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Lyons Ferry Hatchery

Health Monitoring

- At spawning, a minimum of 60 ovarian fluids, 60 milts and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- Prior to transfer or release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.
- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures* – daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—LYONS FERRY HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STS	2,000	2,107	1,081-2,527	
Adult Prespawning Survival	STS	--	89.9%	84-96%	
Egg-take	STS	2,400,000	1,389,500	1.3-1.5 million	
Green Egg-to-Fry Survival	STS	90%	75.3%	57.4-87.8%	1
Fry-to-Smolt Survival	STS	90%	91.8%	86.5-95.1%	2
Fish Releases	STS	875,000	837,782	610K-970K	
Egg Transfers	STS	0	-- ¹	-- ¹	
Fish Transfers	STS	0	-- ¹	-- ¹	
Adults Back to River	STS	--	978	500-1,400	
Percent Survival	STS	--	0.5%	0.05-1.03%	3

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	STS	Yes	Yes	--	
Proper Release Size	STS	Yes	Yes	--	
Proper Release Time	STS	Yes	Yes	--	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STS	Yes	Yes	--	
Spawning Pop. >200	STS	Yes	Yes	--	
Spawning Ratio Male:Female	STS	1:1	2.1:1	2.03:1 - 2.18:1	4
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply Inc.</u>	<u>Supply Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Lyons Ferry Hatchery</u> STS/ Lyons Ferry	G	G	IHN			
<u>Cottonwood RP</u> STS/Cottonwood Cr	N/A	SA	IHN			
<u>Dayton RP</u> STS/Lyons Ferry	N/A	SA				
<u>Tucannon Hatchery</u> STS/Tucannon R	G	G,SA	IHN			
<u>Curl Lake RP</u> STS/Lyons Ferry	N/A	SA				

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments—Lyons Ferry Hatchery

1. The IHN virus is sometimes found in the broodstock, resulting in the destruction of eggs.
2. The IHN virus is sometimes found in fingerlings, resulting in the destruction of fish. This makes the fingerling-to-smolt survival difficult to estimate.
3. The percent survival estimate does not include naturally spawning fish.
4. Many males produce inadequate sperm so additional males are used.

{tc "Lyons Ferry Salmon Hatchery"}Lyons Ferry Salmon Hatchery

INTRODUCTION

Lyons Ferry Salmon Hatchery is located downstream of the confluence of the Palouse and Snake rivers, about 7 miles west of Starbuck, Washington. This facility is part of a complex which rears trout and steelhead in one portion of the hatchery complex. The spring chinook acclimation pond and adult trap at Tucannon Hatchery is operated as a satellite facility. The hatchery is staffed with 6.5 FTE's.

Rearing units at the salmon hatchery consist of 28 raceways and 4 rearing ponds. The raceways were not designed to allow direct release of fish into the Snake River. Therefore, smolts must be pumped to either the river or barges which transport them downriver.

Water rights total 53,200 gpm from wells. Water temperatures range from 52°-54°F. No river water is currently being utilized.

On June 27, 1991 the National Marine Fisheries Service proposed a determination that Snake River spring and summer chinook salmon be included as a threatened species under the Endangered Species Act (ESA).

Rearing Facilities at Lyons Ferry Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Vertical Incubators					1,792		Fiberglass	12	Good	
Raceways	100	10	3	3,000	28	84,000	Concrete	12	Good	
Rearing Pond	150	40	5	30,000	2	60,000	Concrete	12	Good	

PURPOSE

The hatchery began operation in 1984. It was constructed under the Lower Snake River Compensation Program as partial mitigation for federal dams constructed on the lower Snake River. The facility is used for adult collection, egg incubation and rearing of fall chinook and spring chinook salmon.

GOALS

The original mitigation goal for the hatchery was 1,152 adult Tucannon spring chinook and 18,300 adult Snake River fall chinook salmon. Additional hatchery goals are to 1) maintain genetic integrity of these stocks, 2) manage the hatchery operations in accordance with the listing of both stocks as “threatened” under the Endangered Species Act, 3) gather information on short- and long-term effects of hatchery supplementation on an indigenous wild salmon stock, and 4) minimize impacts on other fish stocks.

OBJECTIVES

Objective 1: Hatchery Production

Produce 800,000 yearling fall chinook for on-station release or transfer to and release from upriver acclimation facilities.

Produce 154,000 spring chinook (5,133 pounds) to be transferred to the Tucannon Hatchery for final rearing, acclimation and release.

(Note: Hatchery production objectives are subject to change under ESA considerations.)

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lyons Ferry Hatchery is to collect enough adults of the appropriate stock to maintain the hatchery production program while minimizing adverse impacts on wild or native populations. These stocks are listed as “threatened” under the Endangered Species Act.

Spring Chinook: Spring chinook from the Tucannon River are trapped at the Tucannon Hatchery throughout the run (mid-April to October). A maximum of 50 hatchery and 50 wild fish are used. The objectives are to 1) allow as many wild fish upstream for natural spawning as possible, and 2) ensure proportional genetic contribution from both wild and hatchery fish. Adults are transferred to Lyons Ferry Hatchery for holding and spawning.

Fall Chinook: Fall chinook adults either return to the hatchery or are trapped at Ice Harbor and Lower Granite dams. Only marked hatchery fish are trapped at the dams.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook: Rear 90,000 fish to a size of 30 fish/pound; transfer back to Tucannon Hatchery in November for final rearing and acclimation; volitionally release from the Tucannon acclimation pond in April at a size of 15 fish/pound. These activities are done in conformance with the ESA Salmon Recovery Plan and tribal agreements.

Fall Chinook: Rear 900,000 fish to a size of 10 fish/pound and release at the hatchery in April the following year. Fall chinook are reared on well water; therefore, they are not acclimated to parent river water prior to release. Additional efforts are underway to provide acclimation facilities upstream of Lower Granite Dam for a portion of the production. These activities are done in conformance with the ESA Salmon Recovery Plan and tribal agreements.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained and appropriate stocks are utilized in the hatchery. Adults and “jacks” are collected in proportion to their prevalence in the run.

Spawning Protocol—All Stocks

The intent of the spawning protocols used for fall and spring chinook is to maintain genetic diversity of these stocks. Male to female spawning ratios will always be 1:1 for each spawning. In cases where sex ratios on a given spawning day are unequal, gametes will be split into subsets for cross-matings. The use of live-spawned males is a viable alternative as well. Prior to spawning, coded-wire tags are read to ensure that only parent stocks are used in matings. Eggs originating from non-Lyons Ferry fall chinook are shipped off-station for use in other Columbia River upriver bright fall chinook programs.

Acceptable Stocks

The stocks approved for release from Lyons Ferry and Tucannon hatcheries are listed below.

Fall Chinook

Snake River fall chinook (confirmed by CWT analysis)

Spring Chinook

Tucannon River spring chinook (confirmed by CWT analysis)

Monitoring

Tucannon River spring chinook salmon are a discrete, genetically isolated population within the Snake River Basin that has received limited, historical hatchery enhancement. Maintenance of the genetic integrity of wild spring chinook salmon stocks is a priority in the Tucannon River. Approximately 80 gene loci in the Tucannon River spring chinook salmon are currently being monitored through

electrophoretic analysis. In addition, a four-year study was initiated in 1990 to determine if measurable genetic differences occur in incubation and rearing performance, and smolt-to-adult survival rates as a result of one generation of hatchery rearing.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Lyons Ferry Salmon Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish stock.
- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from all spawned females. ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult fall and spring chinook are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing ivory soap are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—LYONS FERRY SALMON HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	4,000	1,443	996-1,880	1
	CHS	100	105 ¹	182-510	1
Adult Prespawning Survival	CHF	90%	84.8%	74.2-92.2%	1,2
	CHS	90%	88.5%	78.3-98.2%	1,2
Egg-take	CHF	3,530,000	2,896,854	2,182-3,522K	1
	CHS	136,000	139,653	91K-168K	
Green Egg-to-Fry Survival	CHF	90%	91.9%	89.9-95.3%	3
	CHS	90%	80.6%	60.6-97.0%	
Fry-to-Smolt Survival	CHF	90%	91.0% ²	81.8-95.2%	
	CHS	90%	95.0% ²	92.4-96.4%	
Fish Releases	CHF	3,400,000	2,397,216	760-3,044K	1,3
	CHS	88,000	108,957	74-145K	1,3
Transfers to Co-ops (Eggs/Fish)	CHF	0	--	--	
	CHS	0	--	--	
Other Transfers (Eggs/Fish)	CHF	0	2,028,377 ³	--	
	CHS	0	--	--	
Adults Passed Upstream	CHF	0	0	0	
	CHS	-- ⁴	276	90-439	
Percent Survival	CHF	1.0%	0.23%	--	1
	CHS	2.5%	0.29% ⁵	--	1

N/A=Not applicable.

¹ On average, an additional 276 adults are passed upstream every year.

² Average of four broods, 1987-1990. Fall chinook include both yearling and subyearling releases.

³ Average of three broods. Includes eggs of non-Lyons Ferry origin adults and fry reared for other programs.

⁴ By agreement, a minimum of 60% of the wild-origin fish will be passed upstream, or 1,052 total fish.

⁵ 1986 brood year.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts	CHF	Yes	9.8%	7.3-12.0%	4
CV<10%	CHS	Yes	11.1%	8.5-13.6%	4
Acclimation	CHF	Yes	No	--	5
	CHS	Yes	Yes	--	
Volitional Release	CHF	No	No	--	5
	CHS	Yes	Yes	--	5

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults	CHF	Yes	Yes	Yes	
Throughout Run	CHS	Yes	Yes	Yes	
Spawning Population >500	CHF	Yes	1,599	1,082-2,798	1,2
	CHS	Yes	78	180-327	
Spawning Ratio	CHF	1:1	0.70:1	0.4:1 - 0.9:1	3
Male:Female	CHS	1:1	0.90:1	0.7:1 - 1.2:1	3

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to	CHF	Yes	Yes	--	
Disease Policy	CHS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Lyons Ferry Hatchery</u>	G	G				
CHS/Tucannon R			IHN	+		BKD by ELISA of broodstock
CHF/Snake R			IHN	+		BKD by ELISA of broodstock
<u>Tucannon Hatchery</u>	G	G,SA				
CHS/Tucannon R			IHN	+		BKD by ELISA of broodstock

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	6
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	7
Develop and Review Future Brood Doc.	All	Yes	Yes	--	6
Develop and Review Current Brood Doc.	All	Yes	Yes	--	6

Constraints/Comments—Lyons Ferry Salmon Hatchery

1. Low survival due to dam passage or water flow constraints. Higher mortality due to high water temperatures in the reservoirs or in the Tucannon River during adult migration period. High predation losses in the reservoirs. High harvest rate of Lyons Ferry fall chinook. Section 10 of the Endangered Species Act requires a permit to trap spring chinook, which constrains trapping these fish for broodstock.
2. High river temperatures during adult return increase both egg and adult mortalities. Hauling adults to the hatchery also increases stress-related mortalities.
3. The spawning protocol requires that the origin of each fish be determined before eggs are fertilized. As a result, eggs are not fertilized immediately, which in warm temperature conditions can reduce egg and sperm viability. In addition, some egg lots are shipped to the hatchery prior to fertilization. Softshell disease causes higher mortalities. Warm temperatures during incubation accelerate development requiring fish to be held back during rearing. This can increase the susceptibility to some pathogens. Spawning protocol may eliminate candidate males for spawning (i.e., improper stock) and thus skew the sex ratio from 1:1.
4. Combining progeny of different egg-takes into single ponds increases size variation as does feeding fish at low rations.
5. At Lyons Ferry, the pond design does not allow for direct river release or the use of river water for acclimation. Volitional release may be truncated to coordinate fish outmigration with timing of water spills.
6. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
7. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Merwin Dam Hatchery"}Merwin Dam Hatchery

INTRODUCTION

Merwin Dam Hatchery is located on the North Fork Lewis River downstream of Merwin Dam near Ariel, Washington. The staffing level is 4.0 FTE's.

The facility consists of 10 standard raceways, 4 adult holding ponds, 4 rearing ponds and 2 smolt ponds for volitional outmigration to collection raceways, then trucking for release. The hatchery building contains 4 fry troughs, 6 intermediate raceways and 30 eight-tray-stack vertical flow incubators.

Water is supplied to the hatchery from Lake Merwin using a 5,000-gpm pump station on the dam face. Two intakes are used at depths of 15 and 110 feet. The intake used varies depending upon the time of year and water temperature needs of the hatchery. Water entering the adult holding ponds, incubators, fry troughs and intermediate raceways is disinfected with an ozone system. In addition, ozone disinfection of all water to the fingerling raceways and rearing ponds is available from June 1 through the end of September.

Rearing Facilities at Merwin Dam Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs				21	4	84	Concrete	5	Good	
Raceways				1,871	10	18,710	Concrete	5	Good	
Raceways				353	6	2,118	Concrete	5	Good	
Rearing Ponds				1,364	2	2,728	Concrete	5	Good	
Rearing Ponds				46,918	4	187,672	Concrete	5	Good	
Holding Ponds				1,011	4	4,044	Concrete	5	Good	

PURPOSE

Merwin Dam Hatchery began operating in 1993. It was constructed by PacifiCorp to mitigate for losses of resident and anadromous trout resulting from construction and operation of the Merwin Project on the North Fork Lewis River. The facility is also used for rearing resident and anadromous trout. Steelhead and sea-run cutthroat are released in the Lewis River. Rainbow trout are used for lake management programs. PacifiCorp funds the hatchery operation and maintenance.

GOALS

Produce winter and summer steelhead, sea-run cutthroat trout and rainbow trout for harvest by sport anglers while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead

Produce 125,000 smolts for release in the Lewis River.

Summer Steelhead

Produce 125,000 smolts for release in the Lewis River.

Sea-Run Cutthroat

Produce 25,000 smolts for release in the Lewis River.

Rainbow Trout

Produce 1,000,000 fingerlings for release into area lakes. (This number is subject to review and change.)

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

PLANNED PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report.

Objective 1: Hatchery Production

Adult Collection

Adult steelhead and sea-run cutthroat trout (if available) broodstock are collected at Merwin Dam, Merwin Hatchery and at the Lewis River Salmon Hatchery located 4 miles downstream. Fish are held at Merwin Hatchery for spawning.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum

benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Merwin Hatchery

The specific fish rearing and release strategies used at this hatchery are detailed below.

Winter Steelhead: Rear 125,000 smolts to a size of 6 fish/ pound and release in the Lewis River between April 15 and May 15.

Summer Steelhead: Rear 125,000 smolts to a size of 6 fish/ pound and release in the Lewis River between April 15 and May 15.

Sea-Run Cutthroat: Rear 25,000 smolts to a size of 4 fish/ pound and release in the Lewis River between April 15 and May 15.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adults are collected at Merwin Dam and Lewis River Hatchery throughout the duration of the run. Fish are held at Merwin Hatchery for spawning.

Adult hatchery winter steelhead are collected and spawned from December through February. Early spawning fish are selected for hatchery broodstock so that spawning time of returning hatchery fish precedes wild fish. Approximately 80 percent of the winter steelhead spawning is completed by February 1, while a majority of wild fish spawn in April and May.

Sea-run cutthroat broodstock are also selected for early spawning fish, which will inhibit returning hatchery fish from crossbreeding with wild fish. However, in years of low return, nearly all fish are spawned.

Summer steelhead adults are collected at the Lewis River Hatchery trap and the fish trap located in Merwin Dam.

Spawning Protocol

Each of the three anadromous stocks is held in separate facilities at Merwin Hatchery. The intent is to utilize a spawning population of at least 200 adults. Eggs are held in the smallest possible lots until they have tested negative for IHN and other diseases.

Acceptable Stocks

Steelhead and sea-run cutthroat trout eggs are obtained from adults returning to the Lewis River at Merwin Dam and the Lewis River Hatchery. However, if adequate numbers of adults are not available, other lower Columbia River hatchery stocks of similar genetic lineage may be used.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Merwin Hatchery

Under an agreement, disease control measures are being developed to 1) reduce fish disease outbreaks at Merwin Hatchery, and 2) minimize the discharge of pathogens into the Lewis River above the Lewis River Salmon Hatchery. The control measures include the following elements:

- A year-round supply of disinfected water will be available to the hatchery by disinfecting incoming reservoir waters. The hatchery design will provide disinfected water for all fish from June through December, and for eggs and fry from November through May.
- A system for treating all hatchery effluent water will be installed for use during an occurrence of an emergency or certifiable disease.
- The water supply to the broodstock holding ponds and egg incubation system will be isolated, and the effluent from these facilities will be treated continuously.

Health Monitoring

- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.

- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples when hatchery production exceeds 20,000 pounds of fish.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group

meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—MERWIN HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STW	200	N/A	N/A	1
	STS	300	N/A	N/A	
	SCT	200	N/A	N/A	
Adult Prespawning Survival	STW	75%	N/A	N/A	
	STS	75%	N/A	N/A	
	SCT	75%	N/A	N/A	
Egg-take	STW	165,000	N/A	N/A	2
	STS	250,000	N/A	N/A	
	SCT	42,000	N/A	N/A	
Green Egg-to-Fry Survival	STW	72%	N/A	N/A	
	STS	72%	N/A	N/A	
	SCT	72%	N/A	N/A	
Fry-to-Smolt Survival	STW	83%	N/A	N/A	
	STS	83%	N/A	N/A	
	SCT	83%	N/A	N/A	
Fish Releases	STW	125,000	N/A	N/A	
	STS	125,000	N/A	N/A	
	SCT	25,000	N/A	N/A	
Egg Transfers	STW	0	N/A	N/A	
	STS	0	N/A	N/A	
	SCT	0	N/A	N/A	
Fish Transfers	STW	0	N/A	N/A	
	STS	0	N/A	N/A	
	SCT	0	N/A	N/A	
Adults Back to River	STW	--	N/A	N/A	
	STS	--	N/A	N/A	
	SCT	--	N/A	N/A	
Percent Survival	STW	--	N/A	N/A	
	STS	--	N/A	N/A	
	SCT	--	N/A	N/A	

N/A=Not applicable.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	All	Yes	N/A	N/A	
Proper Release Size	All	Yes	N/A	N/A	
Proper Release Time	All	Yes	N/A	N/A	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STW	Yes	N/A	N/A	
	STS	Yes	N/A	N/A	
	SCT	Yes	N/A	N/A	
Spawning Pop. >200	STW	No	N/A	N/A	
	STS	No	N/A	N/A	
	SCT	No	N/A	N/A	
Spawning Ratio Male:Female	STW	1:1	N/A	N/A	
	STS	1:1	N/A	N/A	
	SCT	1:1	N/A	N/A	
Acceptable Stocks	STW	Yes	N/A	N/A	
	STS	Yes	N/A	N/A	
	SCT	Yes	N/A	N/A	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STW	Yes	N/A	N/A	
	STS	Yes	N/A	N/A	
	SCT	Yes	N/A	N/A	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u> <u>Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./</u> <u>ERM</u>	<u>Other/Comments</u>
<u>Merwin Hatchery</u> SCT/Cowlitz	CS	CS,SA				
STS/Washougal R						
STW/Washougal/ELO			IHN			Returns to Merwin H.

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	N/A	N/A	
Develop and Review Equil. Brood Doc.	All	Yes	N/A	N/A	
Develop and Review Future Brood Doc.	All	Yes	N/A	N/A	
Develop and Review Current Brood Doc.	All	Yes	N/A	N/A	

Constraints/Comments—Merwin Hatchery

Constraints to reaching the hatchery goals will not be apparent until the hatchery is operated for at least five years.

1. None available.
2. Eggs are shipped in.

{tc "Methow Salmon Hatchery"}Methow Salmon Hatchery and Satellites (Twisp River and Chewuch River Acclimation Ponds)

INTRODUCTION

Methow Hatchery is located on the Methow River, 1 mile upstream from the confluence with the Chewuch River in Winthrop, Washington. It is also approximately 1 mile upstream of Winthrop National Fish Hatchery. Site elevation is 1,770 feet above sea level.

The facility is funded by Douglas County PUD and is staffed with 3.5 FTE's. The hatchery has satellite acclimation ponds and upstream migrant traps on the Twisp and Chewuch rivers.

Rearing units include 12 rearing ponds, 24 starter troughs, 3 adult ponds and 3 lined release ponds. The hatchery uses well water to incubate eggs, and well and river water for fish rearing.

Rearing Facilities at Methow Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Trough				111	24	2,664	Concrete	5	Good	
Raceway				2,560	3	7,680	Concrete	5	Good	
Raceway				22,000	12	264,000	Concrete	5	Good	
Rearing Pond				24,750	1	24,750	Concrete	5	Good	
Rearing Pond				22,000	1	22,000	Asphalt	5	Good	Chewack Pond
Rearing Pond				27,000	1	27,000	Asphalt	5	Good	Twisp Pond

PURPOSE

Methow Hatchery began operating in 1992 to replace the fish killed by the Wells Project. The mitigation agreement requires that the hatchery production be consistent with guidelines and procedures developed under the Northwest Power Planning Council's Fish and Wildlife Program.

The central hatchery is used for adult holding, incubation, and rearing of three separate populations of spring chinook salmon. Each population is treated as a separate stock. Two of these stocks are eventually released via the off-station

acclimation ponds. Adult fish are collected from the Twisp and Chewuch rivers, and transported to Methow where they are held and spawned. Following egg incubation and early rearing, juvenile fish are transported to acclimation ponds at the parent river for final rearing and release.

GOALS

Increase the number of naturally spawning spring chinook salmon adults in the Methow, Twisp and Chewuch rivers.

OBJECTIVES

Objective 1: Hatchery Production

Produce up to 246,000 yearling spring chinook smolts for on-station release into the Methow River.

Produce up to 246,000 yearling spring chinook smolts for release into the Twisp River from the Twisp River acclimation pond.

Produce up to 246,000 yearling spring chinook smolts for release into the Chewuch River from the Chewuch River acclimation pond.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Methow Spring Chinook: Adults return from May to August and spawn from August to September. Fish will be trapped at the Foghorn Diversion Dam.

Twisp Spring Chinook: Adults return from May to August and spawn from August to September. Adults are collected via a Japanese-style weir. Adult collection protocols will be developed each year.

Chewuch Spring Chinook: Adults return from May to August and spawn from August to September. Adults will be collected at the Fulton Irrigation Diversion Dam ladder. Adult collection protocols will be developed each year.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

The release strategies established for this hatchery are intended to acclimate and imprint the hatchery fish so that returning hatchery adults do not stray into the spawning areas of other distinct stocks. The release procedures are also intended to 1) imprint the fish so that returning hatchery adults spawn with the donor stock, and 2) minimize adverse interactions (i.e., competition for food and habitat) between hatchery releases and naturally produced fish. The specific rearing and release strategies are outlined below.

Methow Spring Chinook: Rear fish to a size of 15 fish/pound; acclimate to the Methow River water for minimum of six week; volitionally release on-station in April-May.

Twisp Spring Chinook: Incubate and provide early rearing at Methow Hatchery; transport to Twisp acclimation pond for final rearing; volitionally release into the Twisp River in April-May at a size of 15 fish/ pound.

Chewuch Spring Chinook: Incubate and provide early rearing at Methow Hatchery; transport to Chewuch acclimation pond for final rearing; volitionally release into the Chewuch River in April-May at a size of 15 fish/ pound.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Adults will be collected throughout the duration of the run, in as much as possible, to ensure representation from the entire population. For both the Twisp and Chewuch facilities, no more than 30 percent of salmon trapped should be retained for broodstock. This percentage may be adjusted in subsequent years, depending upon hatchery performance, estimates of run strength and broodstock collection efficiency.

The guidelines for mating Methow Complex spring chinook are as follows:

1. Matings will be single-pair, with individual family incubation and rearing for each population.
2. Live-spawn the males and mark them after their use.
3. Cryopreserve milt for successive years. Priority will be placed upon freezing gametes from age-5 males (identified by size).

These methods are used regardless of the number of fish collected for broodstock. A genetic monitoring program is underway to test whether the broodstock and mating procedures are conserving the genetic diversity of the donor stocks.

All salmon released from the Methow Fish Hatchery Complex will be marked (coded-wire tag and adipose clip). This mark is required for assessing survival rates, straying rates and for broodstock management. The tentative plan in ensuing years is to allow all marked salmon to pass upstream and spawn naturally. An external mark may be required to distinguish Methow Complex fish from those released from Winthrop NFH.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The

Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Methow Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from each spawned female (Methow, Twisp and Chewuch spring chinook). ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy. Fish and egg movements outside the subbasin are not appropriate for these facilities.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by separate rooms. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at all WDFW hatcheries:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by steam flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

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Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—METHOW HATCHERY AND SATELLITES

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	Methow CHS	238	N/A	N/A	
	Twisp CHS	238	N/A	N/A	
	Chewuch CHS	238	N/A	N/A	
Adult Prespawning Survival ¹	Methow CHS	80%	N/A	N/A	
	Twisp CHS	80%	N/A	N/A	
	Chewuch CHS	80%	N/A	N/A	
Egg-take	Methow CHS	350,000	N/A	N/A	
	Twisp CHS	350,000	N/A	N/A	
	Chewuch CHS	350,000	N/A	N/A	
Green Egg-to-Fry Survival ¹	Methow CHS	85%	N/A	N/A	
	Twisp CHS	85%	N/A	N/A	
	Chewuch CHS	85%	N/A	N/A	
Fry-to-Smolt Survival ¹	Methow CHS	70%	N/A	N/A	
	Twisp CHS	70%	N/A	N/A	
	Chewuch CHS	70%	N/A	N/A	
Fish Releases	Methow CHS	246,000	N/A	N/A	
	Twisp CHS	246,000	N/A	N/A	
	Chewuch CHS	246,000	N/A	N/A	
Transfers to Co-ops (Eggs/Fish)	Methow CHS	0	N/A	N/A	
	Twisp CHS	0	N/A	N/A	
	Chewuch CHS	0	N/A	N/A	
Other Transfers (Eggs/Fish)	Methow CHS	0	N/A	N/A	
	Twisp CHS	0	N/A	N/A	
	Chewuch CHS	0	N/A	N/A	
Adults Passed Upstream	Methow CHS	2/3 of run	N/A	N/A	
	Twisp CHS	2/3 of run	N/A	N/A	
	Chewuch CHS	2/3 of run	N/A	N/A	
Percent Survival	Methow CHS	1.0%	Unknown	Unknown	
	Twisp CHS	1.0%	Unknown	Unknown	
	Chewuch CHS	1.0%	Unknown	Unknown	

N/A=Not applicable.

¹ Goals are assigned by FERC agreement and do not reflect hatchery expectations.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	
Acclimation	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	
Volitional Release	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	
Spawning Pop. >500	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	
Spawning Ratio Male:Female	Methow CHS	1:3 ¹	N/A	N/A	
	Twisp CHS	1:3 ¹	N/A	N/A	
	Chewuch CHS	1:3 ¹	N/A	N/A	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u> <u>Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./</u> <u>ERM</u>	<u>Other/Comments</u>
<u>Methow Hatchery</u>	G	SA				
CHS/Methow R				+		
CHR/Wells						
CHS/Chewuch R				+		
CHS/Twisp R				+		
CHS/Leavenworth						
SOC/Okanogan				+		BKD by ELISA of broodstock

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	N/A	N/A	
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	N/A	N/A	1
Develop and Review Future Brood Doc.	All	Yes	N/A	N/A	
Develop and Review Current Brood Doc.	All	Yes	N/A	N/A	

Constraints/Comments—Methow Hatchery and Satellites

1. A comprehensive basin-wide production plan has not been completed at this time.

{tc "North Toutle Salmon Hatchery"}North Toutle Salmon Hatchery

INTRODUCTION

The Toutle Hatchery site is located along the Green River about 23 miles east of Castle Rock, Washington. It is situated in a hilly location approximately 770 feet above sea level. The hatchery began operating in 1951 but was destroyed in the 1980 eruption of Mount St. Helens. Hatchery operations were reestablished in 1985.

Two large rearing ponds (Beaver Slough Rearing Ponds) near the hatchery site were only slightly damaged by the eruption. These ponds were cleaned and have been operating since 1985. Twenty-four raceways have been dredged out and placed into operation for rearing. The facility is currently staffed with 4.67 FTE's. Water rights for the Toutle Hatchery total 26,031 gpm from the Green River.

Rearing Facilities at North Toutle Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Raceways				3,650	14	51,100	Concrete		Good	
Rearing Pond				143,740	2	287,480	Asphalt	16	Good	
Rearing Pond				18,525	1	18,525	Dirt	16	Good	Adult Pond
Deep Troughs				31	31	961	Concrete		Fair	

PURPOSE

The hatchery was authorized under the Mitchell Act and began operation as part of the Columbia River Fisheries Development Program – a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service.

The facility is used for adult collection, limited incubation and rearing of tule fall chinook and early (Type-S) coho. The hatchery is currently operating at maximum production. Tule fall chinook stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs

GOALS

Produce adult fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Produce 2,500,000 subyearling tule fall chinook for on-station release.

Produce 1,100,000 yearling Type-S coho for on-station release.

Produce up to 500,000 spring chinook yearlings for on-station release

Produce up to 50,000 summer run steelhead yearlings for on-station release

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Toutle Hatchery is to collect as many adults as possible to maintain the hatchery program. Because tule stocks are not managed to provide adequate escapement to individual hatcheries, shortfalls are made up with imports from other facilities which have surplus eggs.

Tule Fall Chinook: Entry of adults into the subbasin occurs from late August to November. Spawning occurs from late September to November with a peak in October. Adults are captured at a temporary weir which diverts fish into the holding pond. Eggs are incubated on-site.

Type-S Coho: Entry of adults in the subbasin begins in early September and runs through November. Spawning peaks in October. Adults are diverted into the holding pond by a temporary weir. All incubation and rearing are performed on site.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Tule Fall Chinook: Rear 2,500,000 fish to a size of at least 80 fish/pound; release on-station (acclimated) in June.

Type-S Coho: Transfer 1,100,000 fingerlings, if necessary, from Grays River, Elokomina and Lewis River hatcheries in January; rear to a size of 17 fish/pound; release on-station (acclimated) in May.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

The stocks approved for release from the Toutle Hatchery are listed below.

Tule Fall Chinook

Any tule stock

Type-S (Early) Coho

Toutle River Type-S

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Toutle Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon as needed. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

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coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

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PERFORMANCE STANDARDS—TOUTLE HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	1,524	297 ¹	105-396	1
	Type-S COH	1,350	5,256 ¹	2,745-9,874	1
Adult Prespawning Survival	CHF	90%	93.5% ¹	91.5-95.6%	
	Type-S COH	90%	99.3% ¹	99.0-99.5%	
Egg-take	CHF	2,875,000	433,325	184-712K	1
	Type-S COH	1,300,000	2,296,250	1,029-3,356K	1
Green Egg-to-Fry Survival	CHF	90%	N/A	N/A	2
	Type-S COH	90%	N/A	N/A	2
Fry-to-Smolt Survival	CHF	90%	98.8%	98.3-99.6%	
	Type-S COH	90%	99.2%	99.0-99.7%	
Fish Releases	CHF	2,500,000	3,364,800	2,387K-4,714K	
	Type-S COH	1,100,000	760,775 ²	740K-1,293K	1
Transfers to Co-ops (Eggs/Fry)	CHF	0	--	--	
	Type-S COH	0	--	--	
Other Transfers (Eggs/Fry)	CHF	0	--	--	
	Type-S COH	0	--	--	
Adults Passed Upstream	CHF	150	23 ¹	8-43	1
	Type-S COH	1,300	4,117 ¹	691-9,283	
Percent Survival	CHF	1.0%	Unknown	Unknown	3
	Type-S COH	2.5%	4.3% ³	Unknown	3

N/A=Not applicable.

¹ Average of four broods, 1990-1993.

² Based on average of four broods, 1987-1990.

³ Average of three broods, 1986-1988.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts	CHF	Yes	Unknown	Unknown	3
CV<10%	Type-S COH	Yes	Unknown	Unknown	3
Acclimation	CHF	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	4
	Type-S COH	Yes	Partial	--	4

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults	CHF	Yes	Yes	Yes	1
Throughout Run	Type-S COH	Yes	Yes	Yes	1
Spawning Pop. >500	CHF	Yes	No	No	1
	Type-S COH	Yes	Yes	Yes	
Spawning Ratio	CHF	1:3 ¹	0.9:1 ²	0.8:1-1.0:1	
Male:Female	Type-S COH	1:3 ¹	1.0:1 ²	0.8:1-1.2:1	1

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to	CHF	Yes	Yes	--	
Disease Policy	Type-S COH	Yes	Yes	--	

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

² Average of four broods, 1990-93.

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>				<u>Furunc./</u>	
	<u>Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>ERM</u>	<u>Other/Comments</u>
<i>N. Toutle Hatchery</i>	SA	SA				
CHS/Cowlitz R			IHN	+		
CHF/Toutle R						
COH/Type-S				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	5
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	6
Develop and Review Future Brood Doc.	All	Yes	Yes	--	5
Develop and Review Current Brood Doc.	All	Yes	Yes	--	5

Constraints/Comments—Toutle Hatchery

1. Tule fall chinook and Type-S coho stocks are not managed for escapement to individual hatcheries. Lack of adequate broodstock is made up by importing eggs or fingerlings from other facilities which have a surplus. Low river flows during the spawning migration prevent the hatchery from obtaining sufficient broodstock during years when adequate fish numbers are present. Coho returning during high flow periods may be able to bypass the weir. The eruption of Mt. St. Helens severely damaged the river environment which may affect the survival of outmigrating juvenile fish. Harvest levels and migration obstacles may affect sex ratio of returning adults.
2. This facility has no electricity.
3. Lack of current, continuous tag data. Only marked fish are sampled for mean length and coefficient of variation (CV).
4. The time available to volitionally release coho is shorter than desired. Because river flows decline in June, chinook must be forced out of the pond to take advantage of the available flow.
5. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
6. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Priest Rapids Salmon Hatchery"}Priest Rapids Salmon Hatchery

INTRODUCTION

Priest Rapids Hatchery is located just below Priest Rapids Dam along the Columbia River. Elevation of the facility is 445 feet above sea level. It is funded by the Grant County PUD and is staffed with 5.25 FTE's.

The hatchery began operation in 1963 and was originally designed and constructed as a 1 mile-long spawning channel. The upper portion has since been converted into five large rearing ponds. The remainder of the channel is currently unused except for volunteer broodstock trapping and collection.

The facility rears only fall chinook. The rearing units consist of 6 rearing ponds and 12 vinyl raceways. Five of the rearing ponds are used only for smolt production. Two of the ponds are used for adult holding or fry rearing.

Water is supplied to the hatchery from the Columbia River and wells. The majority of the water is supplied by gravity flow from the Columbia River (44,883 gpm) with the wells supplying 8,000 gpm. Both river water and well water are used for adult holding, incubation and rearing.

Rearing Facilities at Priest Rapids Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Vertical Incubators					1,280		Fiberglass	32	Fair	
Raceways	80	8	2.5	1,600	12	19,200	Steel/Vinyl	9	Good	
Rearing Ponds	250	30	3.5	26,250	6	157,500	Concrete	32	Good	Rearing/Adult Holding

PURPOSE

Priest Rapids Hatchery is operated as mitigation facility for fishery impacts caused by the Priest Rapids Project (i.e., Priest Rapids and Wanapum dams). It is used for adult collection, egg incubation, rearing and release of upriver bright (URB) fall chinook. The hatchery also supplies eggs to other hatcheries within the basin, and is therefore managed to allow for adequate escapement.

GOALS

The mitigation agreement with Grant County PUD requires an annual production level of 100,000 pounds of URB chinook, this is equal to the release of 5 million smolts at 50 fish/ pound. An additional 1.7 million smolts are produced as part of John Day Mitigation.

OBJECTIVES

Objective 1: Hatchery Production

Produce 100,000 pounds of subyearling URB fall chinook for on-station release.

Provide URB chinook eggs (surplus to on-station needs) to other facilities which rear this stock.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Priest Rapids Hatchery is to collect enough adults to maintain the hatchery production program. Surplus eggs are supplied to other hatcheries when available.

Adult URB fall chinook return to the hatchery from September 1 through November and are collected as volunteers to the channel. Adults are also collected from a trap at the dam ladder but these fish are usually surplus to the hatchery's on-station production needs. There is usually a sufficient number of eggs taken to meet the hatchery production goals and supply other hatcheries.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations.

Fall chinook is the only species reared at this facility. The goal is to rear fish to a size of 50 fish/ pound, acclimate to parent river and release on-station in mid-June.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks.

When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for release from the Priest Rapids Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Fall Chinook

- 1 Priest Rapids fall chinook
- 2 Mainstem Columbia River upriver brights

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.

- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Priest Rapids Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic

curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to “clean” or isolated areas of the incubation room) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by steam flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring

- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—PRIEST RAPIDS HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	6,102	5,534	2,636-8,963	1
Adult Prespawning Survival	CHF	90%	95.5%	93.8-97.7%	
Egg-take	CHF	7,890,000	11,148,180	6.3-14.8 million	
Green Egg-to-Fry Survival	CHF	90%	92.6%	90.9-94.2%	2
Fry-to-Smolt Survival	CHF	90%	96.9%	94.9-98.4%	
Fish Releases	CHF	6,700,000	5,537,010	5,159K-6,431K	2
Transfers to Co-ops (Eggs/Fish)	CHF	0	548,300	0-2,741K	
Other Transfers (Eggs/Fish)	CHF	100K-17,500K ¹	4,388,800	705K-7,165K	
Adults Passed Upstream	CHF	195	0	0	
Percent Survival	CHF	1.0%	1.17%	0.29-2.44%	1

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHF	Yes	7.2% ²	4.8-9.5%	3
Acclimation	CHF	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	1,4

N/A=Not applicable.

¹ Klickitat, Rocky Reach and other URB programs.

² Average of four broods, 1984-1987.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHF	Yes	Yes	Yes	
Spawning Pop. >500	CHF	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHF	1:3 ¹	0.5:1	0.4:1 - 0.7:1	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHF	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Inc.</u>	<u>Rear.</u>					
<u>Priest Rapids Hatchery</u>	G,SA	G,SA				
CHF/Priest Rapids			IHN			Paramyxovirus
CHF/Little White				+		May have progeny from IHN+ adults

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	5
TSS Max Effluent	All	15 mg/L	N/A	N/A	5
SS Effluent	All	0.1 ml/L	N/A	N/A	5
TSS PA Effluent	All	100 mg/L	N/A	N/A	5
SS PA Effluent	All	1.0 ml/L	N/A	N/A	5
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	6
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	7
Develop and Review Future Brood Doc.	All	Yes	Yes	--	6
Develop and Review Current Brood Doc.	All	Yes	Yes	--	6

Constraints/Comments—Priest Rapids Hatchery

1. High water temperatures in the reservoirs during late summer and early fall can increase stress-related mortality of returning adults. It can also increase mortalities due to columnaris disease and increase egg mortality from the spawned adults. To minimize interactions with naturally spawned populations downstream at Hanford Reach, fish releases are often delayed until after the spill window period. This can delay outmigration time which make smolts more susceptible to predation. Delaying fish releases beyond the optimum release date can also cause additional fish stress related to smoltification and creates a situation in which all fish are released into the river during a short period of time.
2. Soft shell disease decreases egg-to-fry survival. In severe years, this disease can make it difficult to reach on-station program goals or program goals at other hatcheries.
3. Combining juvenile fish from different spawnings into a single pond can increase the proportion of out-sized fish, particularly if the initial rearing temperatures are too cold.
4. Pond design does not allow for simultaneous and extended volitional release from all hatchery ponds.
5. This facility lacks a pollution abatement pond. Effluent is discharged to a drain field.
6. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
7. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Ringold Rearing Pond"}Ringold Rearing Pond

INTRODUCTION

Ringold Rearing Pond is located on the east bank of the Columbia River about 20 miles north of Richland, Washington. Site elevation is 275 feet above sea level. The facility is staffed with 1.3 FTE's.

The facility consists of a 4.8-acre earthen rearing pond. Water rights total 26,929 gpm from springs. Average water use at the WDFW facility is about 1,400 gpm.

Rearing Facilities at Ringold Rearing Pond

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Rearing Pond				1,673,000	1	1,673,000	Dirt	33	Good	

PURPOSE

Ringold Rearing Pond was authorized under the Mitchell Act and began operating in 1962 as part of the Columbia River Fisheries Development Program—a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. This facility is currently used for rearing summer steelhead. Adult fish are not usually trapped or spawned at this facility. Fingerlings are normally transferred in from the state-funded Columbia Basin Hatchery. The National Marine Fisheries Service funds the hatchery operation and maintenance.

GOALS

Produce adult summer steelhead for sport and tribal fisheries.

OBJECTIVES

Objective 1: Hatchery Production

Produce 180,000 summer steelhead smolts for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

- Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.
- Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
- Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.
- Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

No adult collection occurs at this facility. Fingerlings are transferred in from Wells Hatchery and reared until their release in the spring.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition

factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Ringold Rearing Pond

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Summer Steelhead: Rear 180,000 summer steelhead to a size of 4-8 fish/pound and volitionally release on-station into the Columbia River between April 15 and May 15. All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

No adults are collected at this facility.

Spawning Protocol

No spawning occurs at this facility.

Acceptable Stocks

Skamania stock summer steelhead are reared and released at this facility. This stock is thought to be appropriate for this section of the Columbia River. It is also believed

that this stock provides more angler benefits than the Wells stock because of the fish age at maturity and return timing of adults.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Ringold Rearing Pond

Health Monitoring

- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures* – daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—RINGOLD REARING POND

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STS	N/A	N/A	N/A	
Adult Prespawning Survival	STS	N/A	N/A	N/A	
Egg-take	STS	N/A	N/A	N/A	
Green Egg-to-Fry Survival	STS	N/A	N/A	N/A	
Fry-to-Smolt Survival	STS	90%	89.1%	79-94%	1
Fish Releases	STS	180,000	193,371	172K-214K	
Egg Transfers	STS	0	-- ¹	-- ¹	
Fish Transfers	STS	0	-- ¹	-- ¹	
Adults Back to River	STS	N/A	N/A	N/A	
Percent Survival	STS	--	Unknown	Unknown	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	STS	Yes	Yes	--	
Proper Release Size	STS	Yes	Yes	--	
Proper Release Time	STS	Yes	Yes	--	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STS	N/A	N/A	N/A	
Spawning Pop. >200	STS	N/A	N/A	N/A	
Spawning Ratio Male:Female	STS	N/A	N/A	N/A	
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Ringold Springs RP</u>	N/A	G,SA				
STS/Lyons Ferry						

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments—Ringold Rearing Pond

1. Fry-to-smolt survival reduced because of bird predation.

{tc "Ringold Springs Salmon Pond"}Ringold Springs Salmon Pond

INTRODUCTION

Ringold Springs Salmon Pond is located adjacent to the Columbia River about 17 miles west of Mesa, Washington. Site elevation is 275 feet above sea level.

Facility rearing units include an earthen rearing pond (9 acres) and 14 vinyl raceways. The raceways are only used for early rearing. All smolt releases occur from the large rearing pond. There is no incubation facility because of past problems with high water temperatures. This problem needs to be investigated to further determine if the water source could be used for egg incubation.

Water rights total 31,417 gpm from Ringold Springs. About 13,464 gpm of this water right is shared with the Ringold Springs Steelhead Pond. The facility is staffed with 3 FTE's.

Rearing Facilities at Ringold Springs Salmon Pond

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Rearing Pond				2,940,300	1	2,940,300	Dirt	32	Good	
Vinyl Raceways	83	8	2.5	1,660	14	23,240	Steel/ Vinyl	19	Good	

PURPOSE

The facility began operation in 1963 as part of the Columbia River Fisheries Development Program—a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. Funds for the program are administered by the National Marine Fisheries Service. The facility has been used in the past for rearing fall chinook and some coho on an interim basis. It is currently used for adult collection and rearing of spring chinook. There is also an experimental program for the acclimation and release of fall chinook as part of the John Day Mitigation goals.

GOALS

Produce spring chinook and fall chinook that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Produce 1,100,000 yearling spring chinook for on-station release.

Provide acclimation for 3.5 million fall chinook prior to release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Ringold Hatchery is to collect as many adults as possible to maintain the hatchery production program. Spring chinook adults return to the hatchery from April through June. Adults are collected at Ringold and transferred to Lyons Ferry for holding and spawning. After the eggs hatch, the fry are returned to Ringold Hatchery for rearing.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations.

The strategy for spring chinook is to rear 1,100,000 fish to a size of 7 fish/pound and release on-station on April 1. A pump was recently installed in the Columbia River to supply water to the rearing pond, allowing fish to be acclimated prior to release. This will help increase migratory readiness and decrease the residence time in the river during outmigration, thus lessening possible adverse impacts with naturally produced smolts. The program for fall chinook involves the transport of 3.5 million juvenile fall chinook from Bonneville and Little White Salmon hatcheries at a size of 100 fish/pound in late May and acclimating these fish until late June when they are released at 50 fish/pound.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate

hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for release from the Ringold Springs facility have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Fall Chinook

1 Upriver bright fall chinook

Spring Chinook

1 Mid-Columbia River spring chinook

2 Cowlitz River spring chinook

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Ringold Springs Salmon Pond

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish lot. This is done at Lyons Ferry Hatchery.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on juvenile salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Tank trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—RINGOLD SPRINGS SALMON POND

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHS	300	616 ¹	222-1,750	1
Adult Prespawning Survival	CHS	N/A	N/A	N/A	1
Egg-take	CHS	N/A	N/A	N/A	2
Green Egg-to-Fry Survival	CHS	N/A	N/A	N/A	2
Fry-to-Smolt Survival	CHS	90%	82.5% ¹	72-90%	3
Fish Releases	CHS CHF	1,100,000 3,500,000	1,040,000 N/A	870K-1,200K N/A	3,4
Transfers to Co-ops (Eggs/Fish)	CHS	0	--	--	
Other Transfers (Eggs/Fish)	CHS	0	--	--	
Adults Passed Upstream	CHS	N/A	N/A	N/A	
Percent Survival	CHS	2.5%	Unknown	Unknown	5

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHS	Yes	Unknown	Unknown	5
Acclimation	CHS	Yes	Yes	--	1
Volitional Release	CHS	Yes	No	--	1

N/A=Not applicable.

¹ Average of five broods, 1987-1993.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHS	Yes	N/A	N/A	1
Spawning Pop. >500	CHS	Yes	N/A	N/A	1
Spawning Ratio Male:Female	CHS	1:3 ¹	N/A	N/A	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Ringold Springs RP</u>	<u>Inc.</u>	<u>Rear.</u>				
CHS/Carson	N/A	G,SA		+		May have been progeny of IHNV+ adults prior to 1992
CHS/Ringold				+		BKD by ELISA of broodstock
CHF/Bonneville						May have been progeny of IHNV+ adults
CHF/Little White				+		May have been progeny of IHNV+ adults

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	6
Develop and Review Equil. Brood Doc.	All	Yes	No	--	7
Develop and Review Future Brood Doc.	All	Yes	Yes	--	6
Develop and Review Current Brood Doc.	All	Yes	Yes	--	6

Constraints/Comments—Ringold Springs Salmon Pond

1. Inadequate adult holding and spawning facilities. Smolts are only partially acclimated to river water prior to release. This can reduce the migratory urge and extend the outmigration period. Lack of acclimation precludes use of volitional release. A newly installed river pump may allow for acclimation in the future.
2. No incubation facilities at the hatchery site.
3. High chemical content of the rearing water (ammonia-nitrates) is caused by irrigation runoff. This increases fish mortalities because of additional disease problems.
4. Fish in the large rearing pond cannot be adequately protected from avian predators.
5. Lack of current, continuous tag data. Only tagged fish are measured to determine mean length and coefficient of variation (CV).
6. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
7. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Rocky Reach Salmon Hatchery"}Rocky Reach Salmon Hatchery and Satellite (Turtle Rock Island)

INTRODUCTION

Rocky Reach Hatchery is located along the Columbia River, just downstream from Rocky Reach Dam. Site elevation is 800 feet above sea level. The Turtle Rock Island facility, located 2 miles upstream, is operated as a satellite facility. The facility is staffed with 2.75 FTE's.

The hatchery was originally designed as a mile-long spawning channel at Turtle Rock Island. Rearing units consist of eight vinyl raceways at Rocky Reach and four rearing ponds at Turtle Rock.

Water rights are held by Chelan County PUD and total 3,613 gpm from the Columbia River. Water available for use in the Turtle Rock rearing ponds averages 12,000 gpm from the Columbia River.

Rearing Facilities at Rocky Reach Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Rearing Pond	148.5	200	4	29,700	1	29,700	Concrete		Fair	Turtle Rock
Raceways	80	8	2.5	1,600	8	12,800	Steel/Vinyl	26	Good	Rocky Reach vinyls
Heath Incubators					128		Fiberglass	26	Fair	

PURPOSE

Rocky Reach Hatchery and the Turtle Rock satellite facility are owned by Chelan County PUD. They are operated as mitigation facilities for the fishery impacts caused by the construction and operation of Rocky Reach Dam. Rocky Reach Hatchery is used for incubation and early rearing of upriver bright (URB) fall chinook. Fingerlings are later transferred to the Turtle Rock facility for final rearing and release.

GOALS

The mitigation agreement with Chelan County PUD requires 54,400 pounds of total production. URB stock is not managed for escapement to this hatchery.

OBJECTIVES

Objective 1: Hatchery Production

Produce 200,000 yearling URB fall chinook for release from the Turtle Rock Island rearing facility.

Produce 1,600,000 subyearling URB fall chinook for release from the Turtle Rock Island rearing facility.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

There are no adult fish captured at this facility. Fall chinook eggs are transferred from Priest Rapids Hatchery for the yearling program and from Wells Hatchery for the subyearling program. Adult capture facilities are available and could be utilized in the future.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Two different URB fall chinook rearing programs are used at this facility:

- Transfer eyed eggs from Priest Rapids Hatchery; rear to fingerling size at Rocky Reach; transfer to Turtle Rock Island and rear to a size of 8 fish/pound; release on-station (acclimated) in April.
- Transfer green or eyed eggs from Wells Hatchery; start feeding at Rocky Reach; transfer to Turtle Rock Island and rear to a size of 50 fish/pound; release on-station (acclimated) in May/June.

Objective 3: Maintain stock integrity and genetic diversity.

Adult Collection

There are no adults collected at this facility at this time.

Spawning Protocol

There is no spawning conducted at this facility.

Acceptable Stocks

Hatchery production goals at Rocky Reach are met by importing eggs from other facilities with acceptable stocks. The stocks approved for release from Rocky Reach and Turtle Rock Island are listed below.

URB Fall Chinook

Mainstem Columbia River upriver brights

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain

fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the

Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Rocky Reach Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to

coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—ROCKY REACH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	N/A	N/A	N/A	1
Adult Prespawning Survival	CHF	N/A	N/A	N/A	1
Egg-take	CHF	N/A	N/A	N/A	1
Green Egg-to-Fry Survival	CHF	90%	91%	77-98%	
Fry-to-Smolt Survival	CHF	90%	92%	87-98%	
Fish Releases	CHF	1,800,000 ¹	382,000	180K-900K	1,2
Transfers to Co-ops (Eggs/Fish)	CHF	0	--	--	
Other Transfers (Eggs/Fish)	CHF	0	--	--	
Adults Passed Upstream	CHF	N/A	N/A	N/A	
Percent Survival	CHF	2.5%	1.92%	0.4-3.6%	2,3

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHF	Yes	8.4%	7.8-10.0%	
Acclimation	CHF	Yes	Yes	--	
Volitional Release	CHF	No	No	--	

N/A=Not applicable.

¹ Releases involve 200,000 yearlings and 1,600,000 subyearlings.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHF	N/A	N/A	N/A	1
Spawning Pop. >500	CHF	N/A	N/A	N/A	1
Spawning Ratio Male:Female	CHF	N/A	N/A	N/A	1

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHF	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Turtle Rock Hatchery</u>	G	G				
CHS/Leavenworth			IHN	+		
CHF/Wells			IHN	+		
CHF/Priest Rapids			IHN			
COH/Type-S						
<u>Turtle Rock RP</u>	N/A	SA				
CHF/Wells			IHN	+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous monitoring of other parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	4
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	5
Develop and Review Future Brood Doc.	All	Yes	Yes	--	4
Develop and Review Current Brood Doc.	All	Yes	Yes	--	4

Constraints/Comments—Rocky Reach Hatchery

1. No adults are collected at this facility. The rearing program is totally dependent upon obtaining surplus eggs from other facilities.
2. Survival may be decreased due to inadequate water flows, dam passage problems, high water temperatures in the reservoirs, or increased predation.
3. Lack of current, continuous tag data.
4. Insufficient funding to provide adequate support staff.
5. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Skamania Hatchery"}Skamania Hatchery

INTRODUCTION

Skamania Hatchery is located on the North Fork Washougal River about 0.5 mile above the Washougal River. The Washougal River is a north bank tributary of the lower Columbia River, just downstream of Washougal, Washington. The hatchery is staffed with 5 FTE's.

The facility consists of 10 intermediate raceways, 32 raceways, 3 adult holding ponds, and a hatchery building with 80 troughs. Water rights total 11,670 gpm from two sources: North Fork Washougal River and Vogel Creek. The Washougal River provides most water used. Actual water use averages 9,800 gpm and ranges from 6,650 to 11,460 gpm. Vogel Creek water is used for incubation and early rearing, while Washougal River water is used thereafter until spring release.

Rearing Facilities at Skamania Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Adult Raceways	30.5	12	3.6	5,606	3	16,818	Concrete	39	Fair	Also used for rearing
Buckets					200		Plastic	12	Fair	
Intermediates	27	4	2	216	10	2,160	Concrete	39	Fair	
Smolt Trap	12	8.8	2.2	230	1	230	Concrete	39	Fair	
Standard Rwys	76.5	10	2.5	1,913	32	61,216	Concrete	39	Fair	
Troughs	14.4	1	.5	8	80	624	Concrete	39	Good	

PURPOSE

Skamania Hatchery was authorized under the Mitchell Act and began operating in 1956 as part of the Columbia River Fisheries Development Program—a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. The facility is used for adult collection, egg incubation and rearing of winter steelhead, summer steelhead and sea-run cutthroat. The National Marine Fisheries Service funds the hatchery operation and maintenance.

GOALS

Produce adult winter steelhead, summer steelhead and sea-run cutthroat for harvest by sport anglers while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead

Produce 315,000 smolts for on-station and off-station releases.

Provide 400,000 eyed eggs to Vancouver Hatchery.

Summer Steelhead

Produce 300,000 smolts for on-station and off-station release.

Provide 400,000 eyed eggs to Beaver Creek Hatchery, 400,000 eyed eggs to Vancouver Hatchery, and 300,000 eyed eggs to Ringold Hatchery.

Sea-Run Cutthroat

Produce 50,000 sea-run cutthroat smolts for on-station and off-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and differential spawning time from wild fish (winter steelhead).

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Skamania Hatchery is to collect enough adults to maintain the hatchery production program.

Winter Steelhead: Entry of adult hatchery fish into the subbasin occurs from mid-November through February, with a peak in December. Adults are captured and spawned at the hatchery.

Summer Steelhead: Adult hatchery fish enter the subbasin from April through September with a peak in June/July. Adults are captured and spawned at the hatchery.

Sea-run Cutthroat: Cutthroat enter the subbasin from July through October. Adults are captured at the hatchery from October through January.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to

adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Skamania Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Winter Steelhead: Rear 315,000 smolts to a size of 4-8 fish/pound and release approximately 60 percent of the fish on-station between April 15 and May 15. The remaining smolts are released off-station at the following sites:

East Fork Lewis River (Lewisville Park)	55,000
East Fork Lewis River (Daybreak Park)	50,000
Salmon Creek	25,000
Hamilton Creek	5,000
Northwestern Lake (net pens)	50,000
Rock Creek	5,000

All fish are marked prior to release.

Summer Steelhead: Rear 300,000 smolts to a size of 4-8 fish/pound and release approximately 75 percent on-station between April 15 and May 15. The remaining smolts are released off-station at the following sites:

East Fork Lewis River (Lewisville Park)	30,000
East Fork Lewis River (Daybreak Park)	10,000
White Salmon River	31,000
Klickitat River	66,000
Wind River	40,000

All fish are marked prior to release.

Sea-run Cutthroat: Rear 50,000 smolts to a size of 3-5 fish/ pound and release 80 percent on-station between April 15 and May 15. Remaining smolts are released off-station at the following sites:

Hamilton Creek	2,500
Salmon Creek	5,000
Rock Creek	2,500
Salmon Creek	10,000

All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adult hatchery winter steelhead are collected and spawned from December through February. Early spawning fish have historically been selected for hatchery broodstock so that spawning time of returning hatchery fish precedes wild fish. Nearly all hatchery spawning is completed by March 1, while most wild fish spawn in April and May.

Sea-run cutthroat broodstock have also been selected for early spawning fish, which inhibits returning hatchery fish from crossbreeding with wild fish. However, in years of low returns, nearly all fish are spawned.

Summer steelhead are collected from April through fall and spawned from December through February. Most spawning (an average of 92 percent) is completed by February 1.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults and spawn fish at a 1:1 male-to-female ratio. However, difficulty in obtaining sea-run cutthroat sperm has sometimes resulted in using two males per female. Most egg-takes are used in hatchery production.

Acceptable Stocks

Importing eggs from other facilities with acceptable stocks is occasionally done when insufficient number of eggs are available at Skamania Hatchery. Eggs from adults returning to the hatchery are always given priority for on-station use. The sea-run cutthroat stock was started with Cowlitz eggs in the 1980s.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Skamania Hatchery

Health Monitoring

- At spawning, a minimum of 60 ovarian fluids, 60 milts and 60 kidney/spleens are examined for viral pathogens from each fish lot.
- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.
- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.

- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures* – daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—SKAMANIA HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STW	600	559	392-662	1
	STS	1,500	3,473	1,671-8,244	
	SCT	400	428	193-841	
Adult Prespawning Survival	STW	--	100%	100%	
	STS	--	100%	100%	
	SCT	--	94.6%	87.8-98.5%	
Egg-take	STW	500,000	515,870	211K-978K	
	STS	2,000,000	2,365,337	1.7-2.6 million	
	SCT	75,000	75,199	14K-142K	
Green Egg-to-Fry Survival	STW	90%	83.1%	27.6-96.7%	2
	STS	90%	85.2%	69.1-96.6%	2
	SCT	90%	94.8%	89.9-98.2%	2
Fry-to-Smolt Survival	STW	90%	92.0%	53.9-98.2%	2
	STS	90%	94.6%	78.9-99.2%	2
	SCT	90%	75.0%	15.1-97.8%	2
Fish Releases	STW	315,000	241,000	119K-345K	2
	STS	300,000	286,936	176K-360K	2
	SCT	50,000	37,346	30K-44K	2
Egg Transfers	STW	400,000	-- ¹	-- ¹	
	STS	1,100,000	-- ¹	-- ¹	
	SCT	0	-- ¹	-- ¹	
Fish Transfers	STW	0	-- ¹	-- ¹	
	STS	300,000	-- ¹	-- ¹	
	SCT	0	-- ¹	-- ¹	
Adults Back to River	STW	--	0	0	
	STS	--	1,318	0-2,556	
	SCT	--	0	0	
Percent Survival	STW	--	3.5%	1.9-5.7%	
	STS	--	2.6%	2.0-3.3%	
	SCT	--	1.4%	0.5-2.7%	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	All	No	No	--	3
Proper Release Size	All	Yes	Yes	--	
Proper Release Time	All	Yes	Yes	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	
Spawning Pop. >200	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	
Spawning Ratio Male:Female	STW	1:1	2.17:1	1.26:1 - 3.36:1	
	STS	1:1	0.77:1	0.51:1 - 0.87:1	
	SCT	1:1	1.36:1	0.95:1 - 2.17:1	1
Acceptable Stocks	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Skamania Hatchery</u>	SR	SA,SR				
SCT/Washougal			IHN			
STS/Washougal			IHN			
STW/Washougal			IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments—Skamania Hatchery

1. At certain river flows, an impassable barrier limits adult upstream migration to the hatchery.
2. Some fish have had to be destroyed because of IHN virus.
3. Facility design precludes volitional release.

{tc "Vancouver Hatchery"}Vancouver Hatchery

INTRODUCTION

Vancouver Hatchery is located along the lower Columbia River near Vancouver, Washington. Site elevation is 100 feet above sea level. The hatchery is staffed with 3 FTE's.

The facility consists of 4 raceways, 12 circular raceways, 3 earthen rearing ponds, and a hatchery building with 96 troughs. Water rights total 3,927 gpm from one well and several springs.

Rearing Facilities at Vancouver Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
40' Circular Ponds	40		2.1	2,613	12	31,356	Concrete	56	Fair	
East Earth Pond	65	40	3	7,800	1	7,800	Earth	56	Fair	
Old Raceway	83	10	2.67	2,216	1	2,216	Concrete	56	Fair	
Raceways	69.5	9.8	2	1,366	4	5,464	Concrete	22	Fair	
Rearing Lake	210	150	8	282,000	1	282,000	Earth/Conc.	47	Fair	
Smolt Trap	112	9.6	2.5	2,682	1	2,682	Wood side	20	Fair	
Troughs	14.4	1	.5	7	96	691	Concrete	42	Fair	Operate 56 at one time
Upper Earth Pond	84	54	2.5	11,340	1	11,340	Earth	56	Fair	
West Earth Pond	75	40	3	9,000	1	9,000	Earth	56	Poor	Not used

PURPOSE

Vancouver Hatchery began operation in the 1930s to produce steelhead and resident trout for sport and tribal fisheries. Steelhead eggs are transferred in from Beaver Creek and Skamania hatcheries. After hatching, most fish are transferred back to these facilities as fry or fingerlings. One rearing pond at Vancouver Hatchery is used to rear steelhead smolts which are trucked for off-station releases. Vancouver Hatchery is also used for rearing resident trout and channel catfish.

GOALS

Produce adult summer steelhead for harvest by sport and tribal anglers.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead

Produce 120,000 fry for transfer to Skamania Hatchery (eggs obtained from Skamania Hatchery).

Summer Steelhead

Produce 110,000 smolts for off-station release.

Produce 200,000 fingerlings for transfer to Skamania Hatchery (eggs received from Skamania Hatchery).

Rainbow Trout

Produce 600,000 fingerlings for release into Swift Reservoir all or a portion will be handled by Merwin Hatchery.

Brown Trout

Produce 40,000 legal-sized fish for release into Kress, Lacamas and Ice House lakes.

Channel Catfish

Produce 7,000 fingerlings for release into local lakes.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report.

Objective 1: Hatchery Production

Adult Collection

No adult steelhead are collected at this facility. Eggs are transferred in from Skamania and Beaver Creek hatcheries.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum

benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Vancouver Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Winter Steelhead: Incubate 200,000 eyed eggs from Skamania Hatchery and return 120,000 fry back to Skamania Hatchery.

Summer Steelhead: Rear 110,000 summer steelhead to a size of 4-8 fish/pound and release off-station between April 15 and May 15 at the following sites:

Wind River	25,000
North Fork Lewis River	25,000
East Fork Lewis River	25,000
Klickitat River	35,000

All fish are acclimated prior to release.

In addition, eggs from Skamania Hatchery are incubated and hatched at Vancouver Hatchery. Approximately 200,000 fingerlings are then returned to Skamania Hatchery.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

No adult collection occurs at Vancouver Hatchery.

Spawning Protocol

No spawning occurs at Vancouver Hatchery.

Acceptable Stocks

Skamania stock summer steelhead are reared at this facility. This stock is thought to be appropriate for the off-station releases in this area of the Columbia River.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.

- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Vancouver Hatchery

Health Monitoring

- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.

- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures* – daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—VANCOUVER HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STS	N/A	N/A	N/A	
Adult Prespawning Survival	STS	N/A	N/A	N/A	
Egg-take	STS	N/A	N/A	N/A	
Green Egg-to-Fry Survival	STS	90%	93.9%	88.1-99.1%	
Fry-to-Smolt Survival	STS	90%	88.4%	80.6-99.8%	
Fish Releases	STS	110,000	127,000	116K-140K	1
Egg Transfers	STS	0	-- ¹	-- ¹	
Fish Transfers	STS	0	-- ¹	-- ¹	
Adults Back to River	STS	N/A	N/A	N/A	
Percent Survival	STS	--	Unknown	Unknown	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	STS	No	--	--	
Proper Release Size	STS	Yes	Yes	--	
Proper Release Time	STS	Yes	Yes	--	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STS	N/A	N/A	N/A	
Spawning Pop. >200	STS	N/A	N/A	N/A	
Spawning Ratio Male:Female	STS	N/A	N/A	N/A	
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Vancouver Hatchery</u>	G	G				
STS/Washougal						
STW/Washougal						

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-55°F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments—Vancouver Hatchery

1. Available water supply is decreasing due to extensive development of houses and industry in the vicinity of the hatchery.

{tc "Washougal Hatchery"}Washougal Hatchery

INTRODUCTION

The Washougal Salmon Hatchery is located along the Washougal River about 16 miles north of the town of Washougal, Washington. Hatchery site elevation is 120 feet above sea level.

The facility has 24 raceways and 3 earthen rearing ponds. There is also an asphalt-lined adult holding pond which is not used for fish rearing. The facility is staffed with 5.25 FTE's. Water rights total 15,061 gpm from four sources: Washougal River, Bob Creek, Boyle Creek and C-Creek.

Rearing Facilities at Washougal Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Adult Holding Pond							Asphalt		Good	
Deep Troughs					4		Fiberglass	11	Good	
Vertical Incubators					1,152		Fiberglass	11	Good	FAL
Pond 25				100,000	1	100,000	Dirt	26	Fair	
Pond 26				120,000	1	120,000	Dirt	26	Fair	
Pond 27				420,000	1	420,000	Dirt	31	Fair	
Raceways	80	20	3.1	5,000	12	60,000	Concrete	36	Good	
Raceways	135	17.5	3.7	8,750	12	105,000	Concrete	36	Good	
Shallow Troughs					2		Concrete	36	Good	

PURPOSE

The Washougal Hatchery was authorized under the Mitchell Act and began operating in 1959 as part of the Columbia River Fisheries Development Program—a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is used for adult collection, egg incubation and rearing of lower river fall chinook and late (Type-N) coho. It also supplies coho for release into the Klickitat River and provides coho to various sports/educational cooperative groups. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act

hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Tule Fall Chinook

Produce 6 million subyearlings for on-station release.

Provide 500 eggs/fish to co-op programs.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-N Coho

Produce 500,000 yearlings for on-station release.

Provide 220,000 eggs/fish to co-op programs.

Produce 2.5 million yearlings for release into the Klickitat River as per *U.S. v. Oregon Agreement*.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Washougal Hatchery is to collect as many adults as possible to maintain the hatchery production program. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as an aggregate; therefore, adequate escapement for each hatchery's egg-take needs is not considered. Hatcheries with insufficient broodstock receive eggs from any other Mitchell Act facility that has a surplus.

Fall Chinook: Entry of adults into the subbasin occurs from early September to November. Spawning occurs from late September to mid-November with a peak usually in mid-October. Adults are captured at the hatchery site.

Type-N Coho: Adults begin entering the Washougal River in late October and November. Peak spawning occurs in late November and early December. Adults are captured at the hatchery site.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Fall Chinook: Rear 5.5 million fish to a size of 80-100 fish/pound; acclimate in parent river water for a minimum of four weeks; release at the hatchery in June. Rear 500,000 fish to a size of 40 fish/pound; acclimate and release at the hatchery in August.

Type-N Coho: Rear 2.5 million fish to a size of 20 fish/pound; truck and release these fish into the Klickitat River (nonacclimated) in April. Rear 500,000 fish to a size of 17 fish/pound; acclimate to parent river water for a minimum of 4 weeks; release at the hatchery in May-June.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol—All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs/fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for release from the Washougal Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Fall Chinook

- 1 Washougal fall chinook
- 1 Any lower Columbia River tule stock

Type-N (Late) Coho

- 1 Washougal River Type-N

2 Any Columbia River Type-N stock

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Washougal Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—WASHOUGAL HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	3,530	4,685	3,174-6,719	1
	Type-N COH	4,100	4,759	616-9,316	
Adult Prespawning Survival	CHF	90%	95.4%	93.0-97.3%	
	Type-N COH	90%	98.4%	95.8-100%	
Egg-take	CHF	7,060,000	8,453,500	3,833-12,212K	
	Type-N COH	4,100,000	2,436,400	581-4,267K	
Green Egg-to-Fry Survival	CHF	90%	94.1%	92.0-95.9%	
	Type-N COH	90%	93.6%	90.4-95.0%	
Fry-to-Smolt Survival	CHF	90%	96.3%	91.8-98.8%	2
	Type-N COH	90%	88.7% ¹	82.7-99.4%	
Fish Releases	CHF	6,000,000	5,681,080	4,631K-6,425K	3
	Type-N COH	500,000	1,249,021	934K-1,612K	
Transfers to Co-ops (Eggs/Fish)	CHF	500	528,000 ²	--	
	Type-N COH	220,000	90,000	20K-145K	
Other Transfers (Eggs/Fish)	CHF	0-5 million	716,460	263K-2,900K	
	Type-N COH	2,530,000 ³	1,725,875	837K-2,195K	
Adults Passed Upstream	CHF	0	888 ⁴	0-888	4
	Type-N COH	0	657	0-2,660	
Percent Survival	CHF	1.0%	0.83%	0.2-2.1%	
	Type-N COH	3.5%	Unknown	Unknown	

N/A=Not applicable.

¹ Based on average of five broods, 1987-1991.

² One brood only.

³ Klickitat River smolt plant and Duncan Creek mitigation.

⁴ One brood only, 1987.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts	CHF	Yes	7.0%	6.4-7.5%	5
CV<10%	Type-N COH	Yes	Unknown	Unknown	5
Acclimation	CHF	Yes	Yes	--	6
	Type-N COH	Yes	Partial	--	
Volitional Release	CHF	No	No	--	7
	Type-N COH	No	No	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults	CHF	Yes	Yes	Yes	3
Throughout Run	Type-N COH	Yes	Yes	Yes	3
Spawning Pop.	CHF	Yes	Yes	Yes	
>500	Type-N COH	Yes	Yes	Yes	
Spawning Ratio	CHF	1:3 ¹	0.9:1	0.7:1 - 1.0:1	
Male:Female	Type-N COH	1:3 ¹	1.0:1	0.8:1 - 1.2:1	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to	CHF	Yes	Yes	--	
Disease Policy	Type-N COH	Yes	Yes	--	

¹ Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Washougal Hatchery</u>	CS	SA				
CHF/Kalama R				+		
CHF/Washougal R				+		Reovirus
COH/Type-N				+		
COH/Type-S				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	8
TSS Max Effluent	All	15 mg/L	N/A	N/A	8
SS Effluent	All	0.1 ml/L	N/A	N/A	8
TSS PA Effluent	All	100 mg/L	N/A	N/A	8
SS PA Effluent	All	1.0 ml/L	N/A	N/A	8
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	10
Develop and Review Future Brood Doc.	All	Yes	Yes	--	9
Develop and Review Current Brood Doc.	All	Yes	Yes	--	9

Constraints/Comments—Washougal Hatchery

1. Tule fall chinook and Type-S coho are not managed for escapement to individual hatcheries. Shortfalls are made up with surplus eggs from other hatcheries.
2. Transporting fish to the Klickitat River result in excessive handling and stress. No acclimation prior to release into the Klickitat River likely increases mortality even more.
3. Low flows in the spring cause overloading in some ponds. Low flows in the fall may preclude some portions of the run from reaching the hatchery. High flows in the fall result in coho escaping above the racks. Bird predation in large rearing ponds can be high.
4. Impassable falls located 1/2 mile above the hatchery limits the area available for natural rearing and thus reduces the number of adults to pass upstream.
5. Lack of current continuous tag data. Only tagged fish are measured for mean length or coefficient of variation (CV). Warm water temperatures in the summer make rearing and release until the fall very difficult.
6. Water used for rearing coho is from the Washougal River and a creek. Coho released into the Klickitat River are not acclimated.
7. Design of pond outfall will not facilitate volitional release.

8. Abatement pond is inadequate which can cause violation of water quality standards. No funds are currently available to improve the pond.
9. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
10. A comprehensive basin-wide production plan has not been completed at this time.

{tc "Wells Hatchery"}Wells Hatchery

INTRODUCTION

Wells Hatchery is located along the upper Columbia River near Wells Dam. Site elevation is 750 feet above sea level. This facility is staffed with 4 FTE's. Facility rearing units include a 5-acre pond (which was subsequently divided into 4 ponds of various sizes), 10 raceways, and a hatchery building with 40 troughs.

Water for the facility is supplied from 13 wells (13,000 gpm) and the Columbia River (10,722 gpm gravity flow). Well water is used to rear eggs and fry through the summer. Columbia River water is used from November until spring release.

PURPOSE

Wells Hatchery is owned and funded by Douglas County PUD and operated by WDFW. It was constructed in 1967 as mitigation for fishery losses caused by the construction and operation of Wells Dam. It is used for adult collection, egg incubation and rearing of summer steelhead and chinook. It is also used for rearing rainbow trout. Only the steelhead and rainbow trout production is addressed in this report.

Rearing Facilities at Wells Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Adult Raceway	46.3	10	5.7	2,664	1	2,664	Concrete	28	Good	Not used for rearing
Vertical Incubators					160		Fiberglass	28	Fair	
Intermediate Rwy	30.4	4	1.7	203	1	203	Aluminum	11	Good	Inside building
New Raceways	89.2	9.6	2.7	2,281	4	9,124	Concrete	9	Good	
Old Raceways	89.2	9.8	2.7	2,338	6	14,028	Concrete	28	Good	
Portable Rwys	79.2	8	2.7	1,686	8	13,488	Vinyl Lined	10	Fair	Used for marking
Rearing Pond #1	440	100	5	220,000	1	220,000	Earth/Liner	28	Fair	
Rearing Pond #2	667	120	5	400,000	1	400,000	Earth/Liner	28	Good	
Rearing Pond #3	520	100	5	260,000	1	260,000	Earth/Liner	28	Good	
Rearing Pond #4	464	110	5	255,000	1	255,000	Earth/Liner	28	Fair	
Ponds 1-3 Trap	43.3	6	4	1,040	1	1,040	Concrete	28	Fair	
Pond 4 Trap	40	6	4	960	1	960	Concrete	9	Fair	
Shallow Troughs	14.4	1	.5	7	42	302	Concrete	28	Fair	

GOALS

Produce adult summer steelhead for sport and tribal fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead

Produce 450,000 smolts for off-station release.

Rainbow Trout

Produce 30,000 rainbow trout for release in local lakes.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report.

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Wells Hatchery is to collect enough adults to maintain the hatchery production program. Hatchery summer steelhead enter the hatchery from August through November. About 10 percent of the adults retained for broodstock are wild fish. Fish are spawned in January and early February.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies—Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an underescaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Wells Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Summer Steelhead: Rear 450,000 summer steelhead smolts to a size of 4-8 fish/pound and release off-station into the Okanogan, Methow, Similkameen, Twist and Chiwawa rivers between April 15 and May 15. Fish numbers released into these rivers vary from year to year.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adult steelhead retained for broodstock are selected by proportional return time (e.g., 20 percent August fish, 30 percent September fish, etc.). To accelerate spawning time, adult fish are held under lighted conditions and reared on warmer well water. Steelhead are spawned at the hatchery from January through early February. In comparison, wild fish spawn in May. An average of 7.5 percent of the females spawned are wild fish.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults. Most egg-takes are used in hatchery production. Approximately 3 to 4 males are spawned with 5 females.

Acceptable Stocks

Only eggs from hatchery and wild summer steelhead adults returning to Wells Dam are used for hatchery production. This helps retain the genetic integrity of upper Columbia River steelhead. Approximately 10 percent of the fish spawned are wild fish.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.
- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.
- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.
- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Wells Hatchery

Health Monitoring

- At spawning, a minimum of 60 ovarian fluids, 60 milts and all kidney/spleens are examined for viral pathogens. This protocol was adopted because of the previous presence of IPN virus. This virus has only been isolated from adult summer steelhead.
- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.
- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.

- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of adult and juvenile fish.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperatures* – daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—WELLS HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STS	520	670	603-735	
Adult Prespawning Survival	STS	--	98.3%	97.1-99.7%	
Egg-take	STS	1,400,000	1,780,948	1.6-1.9 million	
Green Egg-to-Fry Survival	STS	90%	84.8%	74.1-91.4%	
Fry-to-Smolt Survival	STS	90%	98.0%	94.1-99.5%	
Fish Releases	STS	450,000	690,862	652K-826K	
Egg Transfers	STS	600,000	-- ¹	-- ¹	
Fish Transfers	STS	0	-- ¹	-- ¹	
Adults Back to River	STS	N/A	N/A	N/A	
Percent Survival	STS	--	Unknown	Unknown	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Volitional Release	STS	No	No	--	
Proper Release Size	STS	Yes	Yes	--	
Proper Release Time	STS	Yes	Yes	--	

N/A=Not applicable.

¹ Not estimated for this report.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STS	Yes	Yes	--	
Spawning Pop. >200	STS	Yes	Yes		
Spawning Ratio Male:Female	STS (hatchery) STS (wild)	1:1.2 1:1.2	1:1.2 1:1.33	1:1.15 - 1:2.55 1:1.04 - 1:1.57	
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Wells Hatchery</u>	G	G,SA				
STS/Wells			IPN			Progeny of IPNV+ parents were destroyed

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

{tc "Wells Salmon Hatchery"}Wells Salmon Hatchery

INTRODUCTION

Wells Salmon Hatchery is located along the Columbia River just below Wells Dam. Site elevation is 750 feet above sea level. The facility is funded by the Douglas County PUD. The facility is staffed with 3.7 FTE's.

The rearing units consist of 12 raceways and 4 rearing ponds of varying sizes. Water to the rearing facilities is supplied from 13 wells and the Columbia River. Average flows available to the hatchery are 78,000 gpm from the Columbia River and 9,000 gpm from the wells.

Rearing Facilities at Wells Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Vertical Incubators					728		Fiberglass	26	Good	Heath
Raceways	90	10	3	2,700	8	21,600	Steel/Vinyl	9	Good	
Raceways	100	10	2.25	2,250	4	9,000	Concrete	26	Good	
Rearing Pond	190	20	4	15,200	2	30,400	Concrete	26	Good	
Rearing Pond	250	25	4	25,000	1	25,000	Concrete	26	Good	
Rearing Pond	183	25	4	18,300	1	18,300	Concrete	26	Good	Adult holding

PURPOSE

The hatchery is situated on 30 acres owned by Douglas County PUD and is operated as mitigation facility for fishery impacts caused by the Wells Dam. The facility is used for adult collection, egg incubation and rearing of fall chinook and summer chinook. It is also used to trap and spawn summer chinook for the Methow and Similkameen programs as part of the Rock Island Dam mitigation program at Eastbank Hatchery.

GOALS

The mitigation agreement with Douglas County PUD requires an annual production level of 56,200 pounds of summer chinook. Upriver bright (URB) fall chinook are not managed to provide adequate escapement to this hatchery.

OBJECTIVES

Objective 1: Hatchery Production

Summer Chinook

Produce 320,000 yearlings and 484,000 subyearlings for on-station release.

Trap, hold and spawn adult summer chinook for transfer of 1,300,000 green eggs to Eastbank Hatchery.

Provide 2,000 eggs to co-op programs for educational purposes.

Fall Chinook

Produce 100,000 subyearlings for transfer to the Lake Chelan net pens.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Wells Hatchery is to collect enough adults to maintain the hatchery production program and provide sufficient escapement to the Methow, Similkameen and Okanogan rivers. An additional goal is to provide summer/fall chinook to other hatcheries in the basin. Adults are trapped at both the east and west ladders of the dam and as volunteers to the hatchery.

Summer Chinook: Adults return from July to September and spawn from October to November. Peak spawning occurs in October. Adults are captured at the channel outfall or the east ladder of Wells Dam. Summer chinook are separated from fall chinook at the hatchery using coded-wire tags and a cut-off date of August 28. Fish spawned after this date are considered fall chinook.

Fall Chinook: Adults return from September through November. Peak spawning occurs in November. Adults are captured in the channel outfall.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

The rearing and release strategies developed for this facility are designed to minimize adverse interactions (i.e., competition for food or habitat) between hatchery-released and naturally produced smolts. A large size at release increases smolt migration speed, thus reducing the residence time in the river. The specific rearing and release strategies used at this facility are outlined below.

Summer Chinook: Rear 484,000 fish to a size of 20 fish/pound and release on-station in June. Rear 320,000 fish to a size of 10 fish/pound; acclimate to parent river water for several months; release on-station in April.

Fall Chinook: Rear 100,000 fish to a size of 50 fish/pound and transfer to the Lake Chelan net pen in May.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained. Summer chinook collection is terminated by August 28 to ensure that this stock does not overlap with fall chinook. Adult collection is managed throughout the season in response to fish counts at Rocky Reach Dam to ensure adequate escapement above Wells Dam. Most fish used for broodstock are volunteers with a component coming from the traps at the dam.

Spawning Protocol—All Stocks

Adult fish are spawned at 1:1 male-to-female spawning ratio. A portion of each day's egg-take is used for on-site hatchery production. Gametes from adults spawned in November are incubated separately until coded-wire tags from the spawned adults are read. If fish are identified as Priest Rapids fall chinook, the eggs may be transferred to that station, or used in the Lake Chelan program.

Acceptable Stocks

There are no stocks imported to achieve production goals for summer chinook. Fall chinook broodstock can be any mid-Columbia URB.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease.

- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Wells Salmon Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.
- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from all summer chinook females. ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult summer chinook are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *Upstream and Downstream Temperatures* – twice per month, June through September.
- *Upstream and Downstream Dissolved Oxygen (DO)* – twice per month, June through September.
- *In-hatchery Water Temperatures* – maximum and minimum daily.

- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.
- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures* – continuous monitoring
- *Air Temperatures* – continuous monitoring
- *Influent/Effluent Dissolved Oxygen* – continuous monitoring
- *Influent pH/Conductivity* – continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—WELLS HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	59	302	117-490	
	CHR	1,125	1,147	666-1,642	
Adult Prespawning Survival	CHF	90%	88.4%	65.9-100%	
	CHR	90%	91.2%	83.7-95.7%	
Egg-take	CHF	118,000	734,440	326-1,090K	
	CHR	2,250,000	2,652,960	1,638-3,572K	
Green Egg-to-Fry Survival	CHF	90%	85.2%	77.7-90.4%	2
	CHR	90%	89.1%	84.0-91.9%	
Fry-to-Smolt Survival	CHF	90%	88.0%	85.7-91.7%	3
	CHR	90%	92.2%	77.8-97.5%	
Fish Releases	CHF	--	--	--	2
	CHR 1+	320,000	391,080	372K-429K	
	CHR 0+	484,000	1,455,923	910-2,168K	
Transfers to Co-ops (Eggs/Fish)	CHF	100,000	--	--	
	CHR	2,000	--	--	
Other Transfers (Eggs/Fish)	CHF	0	--	--	
	CHR	1,300,000 ¹	--	--	
Adults Passed Upstream	CHF	0	0	0	
	CHR	0	0	0	
Percent Survival	CHF		No data		
	CHR (0 age)	1%	0.06%	0.02-0.15%	
	CHR (yrl)	1%	0.25%	0.13-0.48%	

N/A=Not applicable.

¹ Methow and Similkameen programs, part of the Rock Island Hatchery Complex.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Release smolts CV<10%	CHF CHR	Yes Yes	-- 11.1% ¹	-- 9.8-12.5% ¹	3,4
Acclimation	CHF CHR	No Yes	-- Yes	-- --	
Volitional Release	CHF CHR	No No	No No	-- --	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHF CHR	Yes Yes	Yes Yes	-- --	
Spawning Pop. >500	CHF CHR	Yes Yes	174 1,220	0-383 1,000-1,642	1
Spawning Ratio Male:Female	CHF CHR	1:3 ² 1:1	0.8:1 0.9:1	0.7:1-1:1 0.7:1 - 1.4:1	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHF CHR	Yes Yes	Yes Yes	-- --	

¹ Two years of data.

² Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u> <u>Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./</u> <u>ERM</u>	<u>Other/Comments</u>
<u>Wells Hatchery</u> CHS/Leavenworth	G	G,SA				Rec'd progeny of IHNV+ parents spawned @ Leavenworth 8/92
CHR/Wells			IHN	+		
CHF/Wells			IHN	+		
CHF/Priest Rapids						

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1.0 ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	5
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	6
Develop and Review Future Brood Doc.	All	Yes	Yes	--	5
Develop and Review Current Brood Doc.	All	Yes	Yes	--	5

Constraints/Comments—Wells Hatchery

1. Poor fish survival caused by a number of factors including dam passage problems, water flow Constraints which delay migrations, high river water temperatures, or high levels of predation in the reservoirs.
2. Egg survival may decrease due to softshell disease problems.
3. Because of inadequate amounts of well water, it is occasionally necessary to re-use the rearing water. This can increase the effective rearing densities and decrease survival. Inadequate number of ponds for yearling program has also resulted in an increased density index and increased incidence of bacterial kidney disease.
4. Ponding of progeny from different egg-takes can increase size variation.
5. Insufficient funding to provide adequate support staff to review all hatchery records.
6. A comprehensive basin-wide production plan has not been completed at this time.

INTEGRATED
HATCHERY
OPERATIONS
TEAM



U.S. Fish and Wildlife Service Hatchery Operation Plans

{tc "Abernathy Salmon Culture Technology Center"}Abernathy Salmon Culture Technology Center

INTRODUCTION

The Abernathy Salmon Culture Technology Center (Abernathy SCTC) is located along Abernathy Creek, approximately 3 miles upstream from the creek's confluence with the Columbia River. Site elevation is 187 feet above sea level.

Juvenile rearing facilities are in fair condition and consist of 12 standard raceways. The adult holding pond is in poor condition and sometimes is used for rearing juvenile fish. Staffing for the fish culture program totals 3.0 FTE's. Additional staff is also assigned to the station to fulfill other duties.

Water rights total 20,600 gpm from Abernathy Creek and one well. Actual water use averages about 6,000 gpm from Abernathy Creek and 300 gpm from the well. The well water has a high iron content and the amount currently utilized is limited by the capacity of the iron filter. A new well was recently drilled and the USFWS has applied for a water right of 3,000 gpm. A pump and piping system have been partially installed.

Rearing Facilities at Abernathy SCTC Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Brood Pond	110	35	1.64	6,314	1	6,314	Concrete	36	Poor	No mechanical sorting
Circular Starter Tanks	6				32		Steel	33	Poor	
Circular Starter Tanks	4				60		Fiberglass	21	Good	
Heath Incubators					30		Fiberglass	22	Fair	30 Stacks/16 trays
Raceways	75	8	2.5	1,500	12	18,000	Concrete	37	Fair	Walls/joints in poor condition
Troughs					6		Fiberglass	28	Poor	

PURPOSE

The facility was originally established as a National Fish Hatchery under provisions of the Mitchell Act—a program to provide for the conservation of Columbia River fishery resources. The facility was constructed in 1959 and fish culture operations

began the following year. In 1961, research activities at the Salmon Culture Laboratory in Entiat, Washington were transferred to Abernathy to expand the laboratory's research program to include fall chinook. Lower river tule fall chinook are the only fish currently reared on a production basis at Abernathy. Adult collection, egg incubation and rearing are all conducted at this facility.

GOALS

The fish production goal at Abernathy SCTC is to produce lower river fall chinook to help compensate for fish losses in the Columbia River Basin caused by mainstem dams. Additional goals of this facility are to 1) develop or improve practical methods for use in artificial propagation of salmon and steelhead, 2) identify techniques for improving smolt quality and survival ability following hatchery releases, and 3) provide technical assistance regarding salmon diet and nutritional needs.

OBJECTIVES

Objective 1: Hatchery Production

Produce 1.5 million subyearling tule fall chinook for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Tule fall chinook adults enter Abernathy Creek from early September to October. Fish swim directly into the hatchery holding pond and are spawned from mid-September through the first week in October.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Fall Chinook: Rear 1.5 million fish to a smolt size of 20-90 fish/pound and release on-station in March, April and May. There are no fry releases from this station.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

All adults that enter the hatchery are used for broodstock to ensure that genetic diversity is maintained. Any fish identified as non-Abernathy origin are not used as broodstock.

Spawning Protocol

Fish are randomly selected and spawned at a 1:1 male-to-female ratio. When excess eggs are taken, culling is accomplished by removing the eggs of individual females from each egg-take until the required number of eggs is obtained. Selection of the female whose eggs are to be removed is determined using a random number generating system except when research dictates other protocols.

Acceptable Stocks

If broodstock numbers are insufficient to meet the hatchery production objectives (i.e., numbers of fish), the hatchery will rear fewer fish to a larger size. In extreme cases, Spring Creek stock are acceptable for use at this facility.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Abernathy SCTC

Health Monitoring

- The fish disease monitoring plan for Abernathy NFH requires the monitoring of juveniles from January through May. The disease inspection includes a sample size of at least 60 fish per lot.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg stocks are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Suspended Solids (TSS)*—Once per month on composite effluent from all outfalls. Once per month from creek ponds effluent and twice per month from abatement pond effluent.
- *Settleable Solids*—Once per month from creek ponds effluent and twice per month from abatement pond effluent.
- *In-hatchery Water Temperatures*—maximum and minimum daily.
- *In-hatchery Dissolved Oxygen*—as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

Abernathy holds an internal production meeting each year. At this meeting, the hatchery project leader reports on the year's accomplishments and receives any changes in production requested by the fishery managers. Changes in production are coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office. This meeting also serves as a forum for the hatchery project leader to share technical information. The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional “Fishery Resource Offices,” and a basin-wide “Columbia River Fisheries Program Office” that participates in the following forums:

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and has developed a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRiS) of the U.S. Fish and Wildlife Service. Future record keeping is coordinated with the basin-wide Coordinated Information System (CIS) development. The CIS development is being funded by Bonneville Power Administration. It is a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The

Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—ABERNATHY SALMON CULTURE CENTER

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	1,000	1,014	452-1,742	1
Adult Prespawning Survival	CHF	98%	98.5%	98-99%	
Egg-take	CHF	1.75M	1.88M	0.54M-2.98M	
Green Egg-to-Fry Survival	CHF	93%	91.6%	89-93%	
Fry-to-Smolt Survival	CHF	95%	92.7%	90.4-96.6%	
Fish Releases	CHF	1.5M	1.16M	0.45M-1.53M	
Egg Transfers	CHF	0	0.52M	0.67M-1.12M	
Fish Transfers	CHF	0	0	0	
Adults Passed Upstream	CHF	0	0	0	
Percent Survival	CHF	1%	1%	0.5-1.3%	1

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	CHF	20	19.6	-- ¹	
		36	36.8	-- ¹	
		60	59.5	-- ¹	
		450	450	-- ¹	
Acclimation	CHF	50%	50%	--	
Volitional Release	CHF	No	No	--	

¹ Not estimated for this report.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHF	Yes	Yes	--	
Spawning Pop. >500	CHF	Yes	633	213-1056	
Spawning Ratio Male:Female	CHF	1:1	1:1.16	1:1.01-1:1.32	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHF	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Abernathy Creek</u>	G	G,SR				
CHS/Abernathy Creek				+	Furunc./ERM (adult)	<i>C. shasta</i> (adult)

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	2
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Abernathy SCTC

1. The adult capture goal is not always met because low stream flows in September can hinder adult migration upstream in Abernathy Creek. This could be alleviated by construction of a weir, trap, and adult holding facility near the mouth of Abernathy Creek.
2. The Equilibrium Brood Document has not been completed at this time.

{tc "Carson National Fish Hatchery"}Carson National Fish Hatchery

INTRODUCTION

Carson NFH is located 13 miles northwest of Carson in Skamania County, Washington. It lies in a heavily forested valley within the Gifford Pinchot National Forest at the confluence of Tyee Creek and Wind River. Elevation of the site is 1,180 feet above sea level. Authorized staff totals 7 FTE's.

The facilities include 46 raceways, 2 rearing ponds and 2 adult holding ponds. Water rights total 42,639 gpm from three sources: Tyee Creek, Tyee Spring and the Wind River. The main water source for the hatchery is Tyee Creek; the Wind River is used as a secondary supply. Incubation and domestic water is provided by Tyee Spring. All water is supplied by gravity flow and all rearing units receive single-pass water.

Rearing Facilities at Carson National Fish Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Brood Pond	146	40	4	23,360	2	46,720	Concrete	42	Fair	
Lower Earth Pond	270	78	3	63,180	1	63,180	Dirt	42	Good	
Upper Earth Pond	170	45	2.25	17,212	1	17,212	Dirt	42	Good	
Raceways	80	8	2	1,280	46	58,880	Concrete	42	Fair	Joints leak
Incubator Trough	20	1.5	1.5	45	24	1,080	Fiberglass	20	Good	
Starter Tanks	15	3.5	2.	105	24	2,520	Fiberglass	20	Good	

PURPOSE

Carson NFH was placed into operation in 1938 to rear and release fall chinook salmon and trout. The hatchery was remodeled in 1956 under the Mitchell Act in an attempt to establish a spring chinook run in the Wind River. The hatchery is currently used for adult collection, egg incubation and rearing of spring chinook. It also provides spring chinook eggs for re-establishing spring chinook runs in some mid-Columbia River tributaries.

GOALS

1. Restore and maintain upriver Columbia River spring chinook salmon stocks.
2. Successfully maintain a self-sustaining run of mature spring chinook salmon that contributes to tribal and sport fisheries while providing adequate escapement for hatchery production.
3. Assure that hatchery operations meet mitigation requirements of the Mitchell Act and are compatible with the Columbia River Fish Management Plan goals.

OBJECTIVES

Objective 1: Hatchery Production

Produce 1.42 million spring chinook smolts for on-station release.

Produce 100,000 spring chinook smolts for off-station release.

Provide 2 million spring chinook eggs to Big White Ponds and state agencies.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult spring chinook enter the hatchery holding pond from May to August. Spawning occurs in August.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 1.42 million fish to a yearling smolt size of 18 fish/pound and release on-station (acclimated) in April. Rear 100,000 yearling smolts and release from acclimation sites in the Umatilla River. There are no fry releases from this station.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

More fish enter the hatchery than are used for broodstock. The fish trap and ladder are operated so that a representative portion of the run remains available to the sport and tribal fisheries in the Wind River or are collected at the hatchery for tribal food bank programs.

Spawning Protocol

Fish are randomly selected and spawned at a 1:1 male-to-female ratio. When culling excess eggs or when removing eggs for off-station transfers, a portion of eggs from each female in that day's egg-take is used.

Acceptable Stocks

If broodstock numbers are insufficient to meet the hatchery production objectives (i.e., numbers of fish), the hatchery will rear fewer fish to a larger size. In extreme cases of a natural disaster, any mid-Columbia River spring chinook stock would be acceptable for use at this facility.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Carson NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish throughout the rearing year.
- At spawning, a minimum of 150 ovarian fluids and 60 kidney/spleens from each species are examined for viral pathogens.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per month on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

The hatchery holds quarterly hatchery evaluation team (HET) meetings. These meetings include hatchery, management, and fish health representatives. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies that might affect, or be affected by hatchery operations. The hatchery evaluation team prepares an annual broodyear report for monitoring our progress at meeting hatchery objectives. Production is coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations. These meetings also serve as a forum to share technical information.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional “Fishery Resource Offices,” and a basin-wide “Columbia River Fisheries Program Office” that participates in the following forums:

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current

management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—CARSON NATIONAL FISH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHS	1,700	2,889	565-4,439	
Adult Prespawning Survival	CHS	95%	97%	95-99%	4
Egg-take	CHS	3.4M	4.7M	0.98-7.6M	
Green Egg-to-Fry Survival	CHS	90%	91%	87-93%	
Fry-to-Smolt Survival	CHS	95%	96.8%	92.0-98.6%	3
Fish Releases	CHS	1.42M	2.24M	2.04-2.34M	2
Egg Transfers	CHS	2M	1.8M	0-0.364M	
Fish Transfers	CHS	600K	300K	0-800K	
Adults Passed Upstream	CHS	0	0	0	
Percent Survival	CHS	0.2%	0.4%	0.17-0.62%	1

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	CHS	18	19.8	15-22	
Acclimation	CHS	Yes	Yes	--	
Volitional Release	CHS	Partial (20%)	Partial (20%)	--	2

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHS	Yes	Yes	--	
Spawning Pop. >500	CHS	Yes	1,857	458-2805	
Spawning Ratio Male:Female	CHS	1:1	1:1.31	1:1.04-1:1.47	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Carson NFH</u>	G	G,SA				
CHS/Carson			IHN	+	Furunc./ERM (adult)	C. shasta (adult)/EIBS

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	5
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Carson National Fish Hatchery

1. Fish survival and quality could be enhanced by placing a cover over the upper and middle banks of raceways. This would help exclude predators, provide cover and safety for employees, and provide better environmental conditions for the fish.
2. Current research indicates that reduced numbers of smolts released may be conducive to larger adult returns.
3. Carson NFH utilizes Tyee Spring water during critical rearing periods. This spring contains resident fish, which have tested positive for bacterial kidney disease. These fish are electroshocked from the spring on an annual basis. Having feral fish in the hatchery water supply means that there will always be the potential for those resident fish to be shedding pathogens into the water supply. Potential for further protection and spring improvement is limited because the USFWS holds no ownership. Dependency on surface water supplies (including Tyee Creek and Wind River) also means that the facility is vulnerable during low water years and there is limited protection against water quality degradation.
4. Adult holding ponds need renovation to accommodate current disease prevention protocols (i.e., erythromycin injection of adults). The current ponds do not allow for the separation of injected and non-injected groups. Pond improvements would also facilitate better handling of adults throughout the spawning cycle.
5. The Equilibrium Brood Document has not been completed at this time.

{tc "Entiat National Fish Hatchery"}Entiat National Fish Hatchery

INTRODUCTION

Entiat NFH is located along the Entiat River, east of Entiat, Washington. Site elevation is 980 feet above sea level. The facility is operated as a satellite of Leavenworth NFH and is staffed with 3.0 FTE's.

Rearing units are in good condition and consist of 43 starter tanks, 30 raceways and 2 adult holding ponds. One adult holding pond is used for overwintering smolts for release in the spring.

Water rights total 15,340 gpm from three sources: the Entiat River, Packwood Spring and wells. Approximately 7,786 gpm is available for hatchery use. The Entiat River and wells provide most of this water flow.

Rearing Facilities at Entiat National Fish Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Circular Tanks				40	27	1,323	Fiberglass	25	Good	
Rectangular Tanks				89	16	1,424	Fiberglass	25	Good	
Heath Incubators					16		Fiberglass	4	Fair	16 trays/stack
Raceways	80	8		1,500	30	45,000	Concrete	20	Good	
Holding Ponds	120	16	5	9,600	2	19,200	Concrete	3	Good	
Troughs	16	1,33	1,	21	4	84	Concrete	55	Fair	

PURPOSE

Entiat NFH was originally authorized by the Grand Coulee Fish Maintenance Project in 1937 and re-authorized by the Mitchell Act in 1938. Hatchery construction began in 1940 and limited operations began one year later. The original hatchery purpose was to mitigate for the loss of salmon spawning grounds caused by Grand Coulee Dam. The hatchery is currently used for adult collection, egg incubation and rearing of spring chinook.

GOALS

Produce spring chinook to help compensate for fish losses in the upper Columbia River drainage caused by construction of Grand Coulee Dam.

OBJECTIVES

Objective 1: Hatchery Production

Produce 400,000 yearling spring chinook smolts for on-station release.

Produce 400,000 subyearling spring chinook smolts for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult spring chinook return to the Entiat River from mid-May to August. Fish swim directly into the hatchery broodstock pond and are spawned from mid-August to early September.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 400,000 fish to yearling smolt size of 16-18 fish/pound and release on-station into the Entiat River (acclimated) in April.

Rear 400,000 fish to a subyearling size of 30 fish/pound and release into the Entiat River in May. There are no fry releases at this facility.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

All fish that enter the hatchery are used as broodstock.

Spawning Protocol

Fish are randomly selected and spawned at a 1:1 male-to-female spawning ratio. If excess eggs are taken, a portion of eggs from each female is kept for on-station rearing and the rest destroyed.

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production goals, the production may be achieved using wild Entiat River fish or Leavenworth stock, in that order of preference.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.

- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Entiat NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required.

Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per month on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

The hatchery holds quarterly hatchery evaluation team (HET) meetings. These meetings include hatchery, management, and fish health representatives. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies that might affect, or be affected by hatchery operations. The hatchery evaluation team prepares an annual broodyear report for monitoring our progress at meeting hatchery objectives. Production is coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office.

The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations. These meetings also serve as a forum to share technical information.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional “Fishery Resource Offices,” and a basin-wide “Columbia River Fisheries Program Office” that participates in the following forums:

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—ENTIAT NATIONAL FISH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHS	650	378	80-730	
Adult Prespawning Survival	CHS	95%	94.9%	91.2-96.7%	
Egg-take	CHS	850K	688K	166K-1,265K	
Green Egg-to-Fry Survival	CHS	95%	91.4%	74.8-97.3%	
Fry-to-Smolt Survival	CHS	95%	87.9%	80.1-94.9%	1
Fish Releases	CHS	800K	774K	716K-897K	1
Egg Transfers	CHS	0	-- ¹	-- ¹	
Fish Transfers	CHS	0	-- ¹	-- ¹	
Adults Passed Upstream	CHS	0	0	0	
Percent Survival	CHS	0.5%	Unknown	Unknown	2

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	CHS	16	16.7	13.0-20.8	3
Acclimation	CHS	Yes	Yes	--	
Volitional Release	CHS	No	No	--	

¹ Not estimated for this report.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHS	Yes	Yes	--	4
Spawning Pop. >500	CHS	Yes	315	69-598	
Spawning Ratio Male:Female	CHS	1:1	1:1.26	1:1-1:1.56	5

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Entiat Hatchery</u>	G	G,S				
CHS/			IHN	+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the U.S. Fish and Wildlife Service.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	6
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Entiat National Fish Hatchery

1. Fish production is limited by pathogen loads in Entiat River water which have rendered this source virtually unusable during parts of the year. Inadequate groundwater production further limits production.
2. No tag data available for this period.
3. The optimal size at release for spring chinook at this facility has not been defined through rigorous controlled experimentation. This subject needs to be fully evaluated before size at release is other than a best guess.
4. The size and configuration of the broodstock holding pond makes separation of fish according to the time of arrival extremely difficult. This impairs the ability to insure that adults are collected from throughout the run in representative proportions.
5. Sufficient numbers of males are not always available to permit a 1:1 spawning ratio.
6. The Equilibrium Brood Document has not been completed at this time.

{tc "Leavenworth National Fish Hatchery"}Leavenworth National Fish Hatchery

INTRODUCTION

Leavenworth NFH is located along Icicle Creek, a tributary of the Wenatchee River approximately 30 miles above the Wenatchee's confluence with the Columbia River. The hatchery is about 4 miles northeast of Leavenworth, Washington. Site elevation is 1,155 feet above sea level.

Hatchery rearing units are in poor condition and consists of 2 adult holding ponds, 45 raceways, 37 Foster Lucas raceways, 72 troughs, and 108 starter tanks.

Water rights total 25,551 gpm from wells, Icicle Creek, and Snow and Nada lakes. Average flow available to the hatchery is 18,170 gpm. There is insufficient water to operate all rearing facilities. Water from Snow Lake and Nada Lake is used to supplement Icicle Creek during low flow periods. The hatchery is staffed with 9.0 FTE's.

Rearing Facilities at Leavenworth National Fish Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Brood Pond	150	15		7,800	2	15,600	Concrete	15	Poor	2,000 gpm flow ea
Standard Raceways				1,600	45	72,000	Concrete	15	Poor	35 gpm flow ea
Foster Lucas Raceways				3,876	30	116,280	Concrete	55	Poor	170 gpm flow ea
Foster Lucas Raceways				13,572	7	95,004	Concrete	55	Poor	500 gpm flow ea
Starter Tanks				90	108	9,720	Fiberglass	20	Poor	36 gpm flow ea
Troughs					72		Concrete	45	Poor	8 gpm flow ea

PURPOSE

The hatchery was originally authorized by the Grand Coulee Fish Maintenance Project in 1937 and re-authorized by the Mitchell Act in 1938. It began operations in 1942. Leavenworth is one of three mid-Columbia hatcheries constructed by the Bureau of Reclamation as mitigation for the Grand Coulee Dam—Columbia Basin Project. It is used for adult collection, egg incubation and rearing of summer steelhead and spring chinook. Entiat NFH and Winthrop NFH are operated as satellite facilities.

GOALS

Produce spring chinook and summer steelhead to help compensate for fish losses in the Columbia River Basin caused by Grand Coulee Dam.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead

Produce 100,000 smolts for on-station release.

Spring Chinook

Produce 1.6 million smolts for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Summer Steelhead: Adult fish return to the hatchery from late April to early May. The fish swim directly into the broodstock holding pond and are spawned in May. Hook and line capture methods are sometimes used to collect adult broodstock when ladder collection is insufficient to meet production goals.

Spring Chinook: Adult fish return to the hatchery from June to August. Fish swim directly into the hatchery's broodstock holding pond and are spawned in September.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Summer Steelhead: Rear 100,000 fish to a yearling smolt size of 7 fish/pound and release on-station (acclimated) in April. No fish are released as fry.

Spring Chinook: Rear 1.6 million fish to a yearling smolt size of 16-18 fish/pound and release on-station (acclimated) in April. No fish are released as fry.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Broodstock are selected so that a representative portion of the entire run contributes to egg collection. Excess fish are allocated to sport and tribal fisheries or distributed from the broodstock holding ponds to tribal subsistence food bank programs.

Spawning Protocol

Fish are randomly selected and spawned at a 1:1 male-to-female spawning ratio. If excess eggs are taken, a randomly selected portion of eggs representing the entire run are destroyed.

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production objectives (i.e., numbers of fish), the hatchery will rear fewer fish. In the extreme case of very poor adult returns, hatchery production may be achieved using Wenatchee River stock, upper mid-Columbia stock or Carson stock, in that order of preference.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.

- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Leavenworth NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per month on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

The hatchery holds quarterly hatchery evaluation team (HET) meetings. These meetings include hatchery, management, and fish health representatives. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies that might affect, or be affected by hatchery operations. The hatchery evaluation team prepares an annual broodyear report for monitoring our progress at meeting hatchery objectives. Production is

coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office.

The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations. These meetings also serve as a forum to share technical information.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional “Fishery Resource Offices,” and a basin-wide “Columbia River Fisheries Program Office” that participates in the following forums:

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will

be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—LEAVENWORTH NATIONAL FISH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	STS	N/A	N/A	N/A	
	CHS	1,000	3,200	478-7,276	
Adult Prespawning Survival	STS	N/A	N/A	N/A	
	CHS	98%	94%	89-96%	
Egg-take	STS	N/A	N/A	N/A	1
	CHS	2.0M	2.13M	0.96M-3.7M	
Green Egg-to-Fry Survival	STS	N/A	N/A	N/A	
	CHS	95%	91%	89-92%	
Fry-to-Smolt Survival	STS	N/A	N/A	N/A	
	CHS	95%	93.4%	90-96%	
Fish Releases	STS	100K	40K	20K-100K	1
	CHS	1.6M	1.92M	1.7M-2.4M	
Egg Transfers	STS	0	0	0	
	CHS	0	500K	170K-2.5M	
Fish Transfers	STS	0	0	0	
	CHS	0	0	0	
Adults Passed Upstream	STS	0	0	0	
	CHS	0	0	0	
Percent Survival	STS	N/A	Unknown	Unknown	2
	CHS	0.5%	0.5%	0.12-0.92%	

N/A=Not applicable.

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	STS	6	6.8	5.8-6.9	3
	CHS	16-18	-- ¹	-- ¹	
Acclimation	STS	Yes	Yes	--	
	CHS	Yes	Yes	--	
Volitional Release	STS	Partial	Partial	--	
	CHS	Partial	Partial	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	STS	Yes	Yes	--	4
	CHS	Yes	Yes	--	
Spawning Pop. >500	STS	Yes	-- ¹	-- ¹	
	CHS	Yes	966	379-1527	
Spawning Ratio Male:Female	STS	1:1	-- ¹	-- ¹	5
	CHS	1:1	1.21	1:1-1:1.8	5

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	STS	Yes	Yes	--	
	CHS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Leavenworth Hatchery</u>	G	G,S				
CHS			IHN	+	Furunc./ERM	C. shasta/EIBS
STS			IPN	+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the U.S. Fish and Wildlife Service.)

¹ Not estimated for this report.

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	6
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Leavenworth National Fish Hatchery

1. Fish production is limited by antiquated, inefficient rearing units (Foster-Lucas ponds) and the hatchery's inability to move the full allocation of Icicle Creek water through the main pipeline. Declining groundwater production from existing wells further limits production.
2. No tag data for this time period.
3. The optimal size at release for spring chinook at this facility has not been defined through rigorous controlled experimentation. This subject needs to be fully evaluated before size at release is other than a best guess.
4. The size and configuration of the broodstock holding pond makes separation of fish according to the time of arrival extremely difficult. This impairs the ability to insure that adults are collected from throughout the run at representative proportions.
5. There are not always sufficient numbers of males available to permit a 1:1 spawning ratio.
6. The Equilibrium Brood Document has not been completed at this time.

{tc "Little White Salmon National Fish Hatchery"}Little White Salmon National Fish Hatchery

INTRODUCTION

Little White Salmon NFH is located on the Little White Salmon River approximately 12 miles east of Stevenson, Washington. The hatchery is situated just above Drano Lake, a water body where the Little White Salmon River joins the Columbia River. Site elevation is 90 feet above sea level.

Rearing facilities consist of 52 raceways of various sizes, 4 adult holding ponds and 10 starter tanks. The hatchery is staffed with 12 FTE's.

Water rights total 33,868 gpm from the Little White Salmon River and springs. Water use for fish production ranges from 11,221 gpm to 28,232 gpm. The river supplies most of this water flow. A water re-use system was constructed in 1967 for egg incubation.

Rearing Facilities at Little White Salmon National Fish Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Adult Holding Ponds	90	30	6	16,200	2	32,400	Concrete	12	Good	
Adult Holding Ponds	191	9.7	2.8	5,188	2	10,376	Concrete	45	Fair	
Raceways	80	8	2.3	1,472	15	22,080	Concrete	45	Poor	Concrete/joints leak
Raceways	80	8	3	1,920	2	3,840	Concrete	45	Poor	Concrete/joints leak
Raceways	79	8	2.4	1,498	4	5,992	Concrete	45	Poor	Concrete/joints leak
Raceways	77	8	2	1,232	6	7,392	Concrete	42	Poor	Concrete/joints leak
Raceways	63	8	2	1,008	6	6,048	Concrete	42	Poor	Concrete/joints leak
Raceways	74	8	3.2	1,894	10	18,944	Concrete	42	Poor	Concrete/joints leak
Raceways	79	8	1.8	1,138	9	10,242	Concrete	41	Poor	Concrete/joints leak
Heath Incubators					122		Fiberglass	20	Good	122 stacks/16 trays
Starter Tanks	15	3	3	135	10	1,350	Fiberglass	17	Good	

PURPOSE

The hatchery was originally constructed in 1898 and was remodeled and expanded in 1958. It currently operates as part of the Columbia River Fisheries Development

Program (Mitchell Act)—a program to provide for the conservation of Columbia River fishery resources. The hatchery is used for adult collection, egg incubation and rearing of Upriver Bright (URB) fall chinook and spring chinook.

GOALS

Successfully maintain and produce URB fall chinook and spring chinook salmon to help compensate for fish losses in the Columbia River Basin caused by mainstem dam construction, which will contribute to tribal and commercial fisheries while providing adequate escapement for hatchery production. Assure that hatchery operations meet mitigation requirements of the Mitchell Act and are compatible with the Columbia River Fish Management Plan goals.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook

Produce 1.5 million fish for on-station release.

URB Fall Chinook

Produce 1.7 million subyearling smolts for on-station release.

Produce 3.7 million subyearling smolts for release above John Day Dam.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Spring Chinook: Adults enter the hatchery holding ponds from mid-April to mid-June. Spawning occurs from mid-July to mid-August.

URB Fall Chinook: Adults enter the hatchery holding ponds from September through October. Spawning occurs from late October to mid-November.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 1 million yearlings to a size of 16 fish/pound and 500,000 subyearlings to a size of 40 fish/pound. Fish are released on-station into the Little White Salmon River in April (yearlings) and June (subyearlings).

URB Fall Chinook: Rear 1.7 million fish to a size of 100 fish/pound and release on-station into the Little White Salmon River in June. Rear an additional 3.7 million fish to a size of 160 fish/pound and transfer to an acclimation site above John Day Dam in March. Fish are acclimated for 16 weeks and released in July.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection—All Stocks

Adult fish return directly to the hatchery facility. Adults are selected so that a representative portion of the entire run contributes to egg collection.

Spawning Protocol—All Stocks

All fish used for spawning are randomly selected. The hatchery goal is to spawn fall chinook at a 1:1 male-to-female ratio and spring chinook at a 1:1 ratio.

Acceptable Stocks

If numbers of returning adults are insufficient to meet the hatchery production objectives, Carson spring chinook and Bonneville fall chinook are acceptable for broodstock use.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.

- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Little White Salmon NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per month on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

The hatchery holds quarterly hatchery evaluation team (HET) meetings. These meetings include hatchery, management, and fish health representatives. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies that might affect, or be affected by hatchery operations. The hatchery evaluation team prepares an annual broodyear report for monitoring our progress at meeting hatchery objectives. Production is

coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office.

The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations. These meetings also serve as a forum to share technical information.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional “Fishery Resource Offices,” and a basin-wide “Columbia River Fisheries Program Office” that participates in the following forums:

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that

coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—LITTLE WHITE SALMON NATIONAL FISH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	2,893	4,410	2,286-8,772	
	CHS	1,800	1,657	678-2,963	
Adult Prespawning Survival	CHF	98%	5.5%	94.5-98.6%	
	CHS	92%	82.3%	74.2-92.1%	
Egg-take	CHF	5.5M	6.1M	5.3M-6.7M	
	CHS	2.0M	2.4M	0.9M-3.7M	
Green Egg-to-Fry Survival	CHF	94%	82.2%	62.2-91.8%	2,4
	CHS	94%	81.2%	68.9-92.0%	2,4
Fry-to-Smolt Survival	CHF	96%	96%	93-98.5%	1,3,4,5
	CHS	95%	95%	87.9-96.8%	1,3,4,5
Fish Releases	CHF	5.4M	2.5M	1.8M-4.0M	
	CHS	1.8M	1.5M	0.8M-2.1M	
Egg Transfers	CHF	0	0.82M	0-2.6M	
	CHS	0	100	0-500	
Fish Transfers	CHF	0	1.7M	6K-3.1M	
	CHS	0	382K	3K-1.03M	
Adults Passed Upstream	CHF	0	0	0	
	CHS	0	0	0	
Percent Survival	CHF	1.0%	1.03%	0.7-1.6%	
	CHS	0.2%	0.18%	0.17-0.22%	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	CHF	100	107.6	95.3-122.6	
	CHS	16	15.9	12.9-18.1	
Acclimation	CHF	Yes	Yes	--	
	CHS	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	
	CHS	Yes	No	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults	CHF	Yes	Yes	--	
Throughout Run	CHS	Yes	Yes	--	
Spawning Pop. >500	CHF	Yes	2,397	1,876-2,788	7
	CHS	Yes	965	405-1,535	
Spawning Ratio	CHF	1:1	1:1.15	1:1-1:1.39	7
Male:Female	CHS	1:1	1:1.35	1:1-1:1.73	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to	CHF	Yes	Yes	--	
Disease Policy	CHS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u> <u>Inc.</u> <u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./</u> <u>ERM</u>	<u>Other/Comments</u>
<i>Little White Salmon H</i>	G,SR	G,SR			
CHS/Little White Salmon		IHN (adult)	+		<i>C. shasta</i> /EIBS
CHF/Spring Creek					No longer reared
CHF/Little White Salmon		IHN (adult)	+		
COH/Little White Salmon			+	Furunc. (adult)	

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the U.S. Fish and Wildlife Service.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	6

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	8
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Little White Salmon National Fish Hatchery

1. Raceway reconstruction and rehabilitation would facilitate disease control and prevention.
2. Construction of a new incubation facility (or replumbing the existing facility) and the installation of an additional production well would promote species separation and would allow the use of single-pass water during incubation and early fish rearing.
3. Water quality on the Little White Salmon River, the major hatchery water source, is directly affected by heavy rains, logging and other human-related disturbances. Results of these activities create heavy silt loads in rearing units and intensive maintenance at hatchery intake structure.
4. There is no disinfection of hatchery water that is used for production purposes. There are brook, brown and rainbow trout populations upstream of the hatchery intake. The Willard NFH and the National Fisheries Research Center are also above this hatchery's intake.
5. Installation of raceway covers would reduce "sunburn" or "white back disease" of young salmon fry. Covers would also reduce stress on fish caused by predatory birds and other animals.
6. Although adequate, expansion of hatchery pollution abatement system would support hatchery compliance with the National Pollutant Elimination System permit and would ease restrictions in the cleaning rearing units.

7. Harvest regulations could allow a 1:1 male-to-female spawning ratio. However, because of the uneven sex ratio of returning adults, all fisheries would have to be unduly restricted.
8. The Equilibrium Brood Document has not been completed at this time.

{tc "Spring Creek National Fish Hatchery"}Spring Creek National Fish Hatchery

INTRODUCTION

Spring Creek NFH is located along the Columbia River at Underwood, Washington, approximately 30 miles upstream of Bonneville Dam. Site elevation is 93 feet above sea level.

Rearing units consist of 44 Burrows ponds, 30 troughs and 1 circular pond. The station is authorized 12 FTE's. Rearing ponds on the Big White Salmon River are considered a substation of Spring Creek NFH.

Water rights total 12,290 gpm from an unnamed creek, two springs, one well and the Columbia River. The Columbia River accounts for about 50 percent of the water right and is only used as a heat source when production water requires heating to accelerate fish growth. Spring water at a constant 46°F is provided from a series of springs that emerge from the cliffs adjacent to the hatchery. This water supply has slowly decreased in recent years from a historical 4,000 gpm to a recent low of 1,800 gpm. The hatchery uses a 90 percent water re-use system with rock and oyster-shell filters. Water is used up to 10 times before being discharged to the pollution abatement facilities.

Rearing Facilities at Spring Creek National Fish Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
<u>Spring Creek</u>										
Burrows Raceways	80	9	2.5	3,188	44	140,272	Concrete	23	Good	
Circular Pond		30	2.5	1,778	1	1,778	Concrete	41	Good	
Heath Incubators					288		Fiberglass	23	Good	288 stacks/16 trays
Starter Tanks	16	1.16	1.17	21	30	651	Fiberglass	22	Good	
<u>Big White Salmon</u>										
Ponds				6,960	2	13,920	Concrete	54	Fair	Floods winter/spring

PURPOSE

Spring Creek NFH was constructed in 1900 and began operating in 1901. It was remodeled in 1955 under Mitchell Act authorization as part of the Columbia River Fisheries Development Program. In 1970, the Army Corps of Engineers razed and remodeled most of the facility to mitigate for fishery losses caused by construction

of the John Day Dam. The hatchery is currently used for adult collection, egg incubation and rearing of tule fall chinook.

Spring chinook fry are brought in from Carson and/or Little White Salmon NFH's to the rearing ponds on the Big White Salmon River. The purpose has been to establish a terminal fishery. Fish are reared and released as fingerlings and yearlings.

GOALS

Successfully produce tule fall chinook to help compensate for fish losses in the Columbia River Basin caused by mainstem dam construction, which will contribute to tribal and commercial fisheries while providing adequate escapement for hatchery production. Assure that hatchery operations meet mitigation requirements of the Mitchell Act and are compatible with the Columbia River Fish Management Plan goals.

OBJECTIVES

Objective 1: Hatchery Production

Produce 15-30 million tule fall chinook smolts for on-station release, including supplying surplus eggs to make up shortfalls at other hatcheries.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Tule fall chinook adults return to the hatchery in September. Fish swim directly into the hatchery from the Columbia River and are spawned as they become ripe in September and October.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Fall Chinook: Rear 15-16 million fish to a smolt size of 35-110 fish/pound and serially release from the hatchery raceways (acclimated) in March, April, and May. Fish in excess of the hatchery's rearing capacity are placed into a circular holding pond and volitionally released into the Bonneville Pool (Columbia River) starting in February.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

All adults that enter the hatchery are used for broodstock unless they are identified as not originating from Spring Creek Hatchery.

Spawning Protocol

Fish are randomly selected and spawned at a <2:1 male-to-female ratio.

Acceptable Stocks

In extreme cases such as a natural disaster, hatchery production may be achieved using fish from Abernathy or Bonneville hatcheries, in that order of preference.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Spring Creek NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.

- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- Eggs are disinfected with iodophor three time per week until they hatch.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts

resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)*—1 to 2 times per month on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures*—maximum and minimum daily.
- *In-hatchery Dissolved Oxygen*—as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

The hatchery holds quarterly hatchery evaluation team (HET) meetings. These meetings include hatchery, management, and fish health representatives. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies that might affect, or be affected by hatchery operations. The hatchery evaluation team prepares an annual broodyear report for monitoring our progress at meeting hatchery objectives. Production is coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations. These meetings also serve as a forum to share technical information.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional “Fishery Resource Offices,” and a basin-wide “Columbia River Fisheries Program Office” that participates in the following forums:

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meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

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In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—SPRING CREEK NATIONAL FISH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHF	7,000	10,573	9,169-13,955	1
Adult Prespawning Survival	CHF	90%	95%	82-97%	
Egg-take	CHF	17.8M	25.7M	20.5M-33.3M	1
Green Egg-to-Fry Survival	CHF	90%	92%	82-94%	
Fry-to-Smolt Survival	CHF	97%	97%	90-97%	
Fish Releases	CHF CHS	15.3M N/A ¹	18.1M 0.92M	15.6M-26.7M 0.5M-1.6M	1
Egg Transfers	CHF	5M	5.2M	0-10.9M	
Fish Transfers	CHF	0	0.96K	1.4K-3.4K	
Adults Passed Upstream	CHF	0	0	0	
Percent Survival	CHF	1.5%	0.33%	0.04-1.12%	1

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	CHF	110 (March) 80 (April) 40 (May)	115 72 36	105-135 65-90 35-45	
Acclimation	CHF	Yes	Yes	--	
Volitional Release	CHF	Partial	Partial	--	

¹ Currently depends on availability of surplus eggs.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHF	Yes	Yes	--	1
Spawning Pop. >500	CHF	Yes	8,372	7,156-10,572	
Spawning Ratio Male:Female	CHF	1:<2	1:1.63	1:1.4-1:1.98	1

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHF	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Spring Creek NFH</u>	G	G				
CHF/Spring Creek			IHN (adults)	+	Furunc./ERM (adult)	C. shasta (adult)

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the U.S. Fish and Wildlife Service.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	2
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Spring Creek National Fish Hatchery

1. Extensive manipulation of commercial fishing seasons prohibits the hatchery from meeting preferred brood collection and spawning goals.
2. The Equilibrium Brood Document has not been completed at this time.

{tc "Willard National Fish Hatchery"}Willard National Fish Hatchery

INTRODUCTION

Willard NFH is located on the Little White Salmon River approximately 4 miles upstream from the Little White Salmon NFH. These two hatcheries are operated as a complex. The manager of Little White Salmon NFH is responsible for both facilities. The facility is authorized a staff of 5 FTE's.

The facilities include 50 standard raceways and 52 starter tanks. Water rights total 24,685 gpm from the Little White Salmon River, wells, a spring, and Carson Depot Springs. Water use at the hatchery ranges from 11,221 gpm to 24,442 gpm with most of the water supplied by the Little White Salmon River. Carson Depot Springs is located off station and is used for incubation. Well water is used for incubation and temperature control during early rearing. All rearing facilities are normally supplied with single-pass water, but in low flow years, water from the upper bank of raceways is re-used in the middle bank.

Rearing Facilities at Willard National Fish Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Raceways	80	8	2.2	1,408	50	70,400	Concrete	43	Fair	
Heath Incubators					24		Fiberglass	19	Good	
Starter Tanks	16	3	1.9	91	52	4,742	Concrete	31	Good	

PURPOSE

Willard NFH was authorized by the Mitchell Act in 1946 and constructed in 1952. The facility was originally planned as a fall chinook hatchery. Because of the cold water temperatures, however, the hatchery switched to spring chinook and coho production. This continued until the mid-1960s when the hatchery switched entirely to coho production. Currently, the hatchery is still only used for rearing coho (adult collection and spawning occurs at Little White Salmon NFH).

GOALS

Successfully produce coho salmon to help compensate for fish losses in the Columbia River Basin caused by mainstem dam construction, which will contribute to tribal and commercial fisheries while providing adequate escapement for

hatchery production. Assure that hatchery operations meet mitigation requirements of the Mitchell Act and are compatible with the Columbia River Fish Management Plan goals.

OBJECTIVES

Objective 1: Hatchery Production

Produce 2.5 million coho smolts (166,600 pounds) for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

There are no adults collected at Willard NFH. Adult coho are collected and spawned at Little White Salmon NFH. Adults enter the holding facility at Little White Salmon from late September through mid-November. Spawning starts in late October and

ends in mid-November. Eggs are incubated at Carson Depot Springs and the eyed eggs are transferred to Willard NFH for rearing and release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Coho: Rear 2.5 million fish to a size of 15 fish/pound and release on-station into the Little White Salmon River in April.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

No adults are collected or spawned at this facility.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Willard NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)* – 1 to 2 times per month on effluent and influent samples. Twice per week on pollution abatement pond effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

The hatchery holds quarterly hatchery evaluation team (HET) meetings. These meetings include hatchery, management, and fish health representatives. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies that might affect, or be affected

by hatchery operations. The hatchery evaluation team prepares an annual broodyear report for monitoring our progress at meeting hatchery objectives. Production is coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office.

The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations. These meetings also serve as a forum to share technical information.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional “Fishery Resource Offices,” and a basin-wide “Columbia River Fisheries Program Office” that participates in the following forums:

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development.

The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—WILLARD NATIONAL FISH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	COH	5,000	4,065	735-12,710	
Adult Prespawning Survival	COH	98%	96.5%	94.3-97.8%	
Egg-take	COH	5M	3.1M	0.8M-7.2M	
Green Egg-to-Fry Survival	COH	75%	74%	59-82%	1,3
Fry-to-Smolt Survival	COH	98%	97%	95-98%	2
Fish Releases	COH	2.5M	2.1M	1.5M-2.9M	
Egg Transfers	COH	0	0.18M	0-0.9M	
Fish Transfers	COH	0	23.9K	0-101K	
Adults Passed Upstream	COH	0	0	0	
Percent Survival	COH	N/A	Unknown	Unknown	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	COH	15	15	14-17	
Acclimation	COH	Yes	Yes	--	
Volitional Release	COH	No	No	--	

N/A=Not applicable.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	COH	Yes	Yes	--	
Spawning Pop. >500	COH	Yes	2,335	638-5,535	
Spawning Ratio Male:Female	COH	1:1	1:1.11	1:1-1:1.19	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	COH	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<u>Willard NFH</u>	G,SR	G,SR				
COH/Little White Salmon				+		CWD
COH/Toutle-Speelyai				+		BKD epizootic buried at Little White Salmon NFH
COH/Kalama						CWD
CHS/Little White Salmon				+		On station 1991-92 only
URB/Little White Salmon				+		On station 1994 only

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the U.S. Fish and Wildlife Service.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	4
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Willard National Fish Hatchery

1. Water intake structure (grusly) is in need of rehabilitation and/or modification. The existing horizontal bar arrangement allows sticks and other debris to enter the hatchery water supply and restrict water flows.
2. Barrier dam at the intake site is in need of rehabilitation. The current structure leaks and does not allow for maximum water flows during low-flow periods.
3. A larger or more efficient settling structure is needed to allow removal of settleable solids in the hatchery water, particularly during periods of heavy silt loads in the river.
4. The Equilibrium Brood Document has not been completed at this time.

{tc "Winthrop National Fish Hatchery"}Winthrop National Fish Hatchery

INTRODUCTION

Winthrop NFH is located along the Methow River in north-central Washington, near the town of Winthrop. Site elevation is 1,760 feet above sea level. The facility is operated as a satellite to Leavenworth NFH and is authorized a staff of 5.0 FTE's.

Rearing units consist of 62 raceways, 2 adult holding pond, 8 troughs and 34 starter tanks. Water rights total 29,930 gpm from the Methow River, Spring Branch Spring and two wells. Water use ranges from 8,528 to 27,686 gpm with the Methow River providing the majority of the flow. All rearing facilities are normally supplied with single-pass water; however, some serial re-use occurs in low flow years.

Rearing Facilities at Winthrop National Fish Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Brood Ponds	80	40	6	19,200	2	38,400	Concrete	47	Fair	
Marisource Incubators					42		Fiberglass	4	Good	8 trays/stack
Raceways	80	8		1,300	30	39,000	Concrete	19	Good	
Foster Lucas Raceways	76	17		2,200	16	35,200	Concrete	54	Fair	
Raceways	102	12		2,200	16	35,200	Concrete	49	Fair	
Starter Tanks	16	3		120	34	4,080	Fiberglass	15	Fair	
Troughs	16	1.33	1	21	8	168	Concrete	54	Fair	

PURPOSE

The hatchery was originally authorized as part of the Grand Coulee Fish Maintenance Project. The first fish cultural operations began in 1942 by trapping adult sockeye, chinook and steelhead at Rock Island Dam and transporting them to the hatchery. By 1951, the station was rearing sockeye, chinook, steelhead, kokanee, coho and resident trout. Winthrop NFH is currently used for adult collection, egg incubation and rearing of spring chinook.

GOALS

Produce spring chinook to help compensate for fish losses in the upper Columbia River drainage caused by construction of Grand Coulee Dam.

OBJECTIVES

Objective 1: Hatchery Production

Produce 1 million yearling spring chinook smolts for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult spring chinook return to the Methow River from mid-May to August. Fish voluntarily swim directly into the hatchery broodstock ponds and are spawned from mid-August to early September.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 1.0 million fish to a yearling smolt size of 16-22 fish/pound and release on-station (acclimated) into the Methow River before April 1. (Note: Research is still needed to determine the optimal release size.) Volitional releases have been made with no apparent improvement in adult returns.

OBJECTIVE 3: MAINTAIN STOCK INTEGRITY AND GENETIC DIVERSITY.

Broodstock Selection

Adult fish return directly the hatchery broodstock pond. The hatchery goal is to collect fish throughout the entire run for spawning.

Spawning Protocol

Fish are randomly selected and spawned at a 1:1 male-to-female ratio. If excess eggs are taken, a randomly selected portion of eggs representing the entire run is destroyed.

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production goals, the production may be achieved using wild Methow River fish or Leavenworth stock, in that order of preference.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs—All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.

- Follow USFWS Fish Health Policy and Implementation Guidelines on the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies (e.g., Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Winthrop NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.
- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.
- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.
- Whenever abnormal behavior or mortality is observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required.

Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)* – 1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.
- *Settleable Solids (SS)* – 1 to 2 times per month on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.
- *In-hatchery Water Temperatures* – maximum and minimum daily.
- *In-hatchery Dissolved Oxygen* – as required by stream flow or weather conditions.

Objective 6: Communicate effectively with other salmon producers and managers.

Coordination/Communication within USFWS

The hatchery holds quarterly hatchery evaluation team (HET) meetings. These meetings include hatchery, management, and fish health representatives. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies that might affect, or be affected by hatchery operations. The hatchery evaluation team prepares an annual broodyear report for monitoring our progress at meeting hatchery objectives. Production is coordinated with the co-managers through the Production Advisory Committee, and with concurrence of the Regional office.

The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations. These meetings also serve as a forum to share technical information.

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meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—WINTHROP NATIONAL FISH HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	CHS	800	223	14-646	1
Adult Prespawning Survival	CHS	95%	87%	67-100%	2
Egg-take	CHS	1.3M	532K	32K-1,470K	
Green Egg-to-Fry Survival	CHS	95%	43.4%	92-95%	
Fry-to-Smolt Survival	CHS	95%	85.8%	79-93%	3
Fish Releases	CHS	800K	897K	556K-1,405K	3
Egg Transfers	CHS	0	0	0	
Fish Transfers	CHS	0	0	0	
Adults Passed Upstream	CHS	0	0	0	
Percent Survival	CHS	0.5%	0.02%	0.001-0.04%	4

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	CHS	16-22	17.5	15.3-19.4	5
Acclimation	CHS	Yes	Yes	--	
Volitional Release	CHS	No	No	--	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	CHS	Yes	Yes	--	6
Spawning Pop. >500	CHS	Yes	197	12-573	
Spawning Ratio Male:Female	CHS	1:1	1:1.54	1:1.03-1:2.62	1,7

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	CHS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply</u>		<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
	<u>Inc.</u>	<u>Rear.</u>				
<u>Winthrop Hatchery</u>	G	G,S				
CHS				+	ERM	<i>C. shasta</i> /EIBS

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the U.S. Fish and Wildlife Service.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Meet Requirements of NPDES Permit	All	Yes	Yes	--	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	8
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments—Winthrop National Fish Hatchery

1. Insufficient adult returns.
2. The adult holding pond is only partially complete and there are currently no construction funds available to complete the project.
3. Production and fish health are limited by several factors, including unusable, antiquated Foster-Lucas ponds, inefficient 12' x 100' raceways, inadequate groundwater supply, and an uncompleted smolt/adult holding pond. In addition, the configuration of the hatchery plumbing limits water management options and reduces the efficiency of groundwater use.
4. No tag return data for this time period.
5. The optimal release size for spring chinook at this facility has not been defined through rigorous, controlled experimentation. This subject needs to be fully evaluated before a target size at release is other than a best guess.
6. The size and configuration of the broodstock holding pond makes separation of fish according to time of arrival extremely difficult. This impairs the ability to insure that adults are collected from throughout the run in representative proportions.
7. There are not always sufficient numbers of males available to permit a 1:1 male-to-female spawning ratio.
8. The Equilibrium Brood Document has not been completed at this time.

INTEGRATED
HATCHERY
OPERATIONS
TEAM



Colville Confederated Tribes Hatchery Operation Plan

Cassimer Bar Hatchery

INTRODUCTION

Cassimer Bar Hatchery is located approximately 3 miles north of Brewster, Washington on the Colville Indian Reservation. The hatchery is located near the Columbia River by a section of the river called the Wells Pool. The facility is staffed with 3 FTE's year around. The hatchery was built on Douglas County Public Utility property in 1992. It is currently a temporary facility.

PURPOSE

The hatchery is part of the Wells Settlement Agreement Phase 1 sockeye salmon production program. The program is compensating for downstream juvenile fish losses incurred by Wells Dam. Under Phase 1 full production, the facility is scheduled to produce 8,000 pounds of cultured sockeye salmon. Currently, the facility produces approximately 880 pounds of cultured accelerated 0-age sockeye salmon. The purpose of the three-year pilot program is to learn if, or how Okanogan River sockeye salmon can be propagated in a hatchery environment. Fish production will increase to 15,000 pounds if the hatchery program moves forward in the future.

GOALS

The goal of the Cassimer Bar facility is to successfully supplement the Okanogan River natural production sockeye salmon in a biologically sound manner.

OBJECTIVES

Objective 1: Hatchery Production

Hatchery production varies based on broodstock availability. The Settlement language states that 200,000 juveniles will be raised to approximately 25 fish/lb. Currently, under the Tribal/PUD contract, the juveniles are cultured at the hatchery, transferred to net pens located in Lake Osoyoos, and reared to a release size of at least 76 fish/lb.

Objective 2: Reduce ecological interactions with other fish populations through proper rearing and release strategies.

- Objective 3: Maintain stock integrity and genetic diversity through proper management of genetic resources.
- Objective 4: Maximize survival at all life stages using proper culture techniques including but not limited to IHOT standards for Hatchery Operations.
- Objective 5: Meet, as a minimum, fish health guidelines established by IHOT.
- Objective 6: Carry out the scope of work and contractual obligations. Monitor and evaluate as outlined in the Wells Settlement Agreement and the Tribal/PUD contract.
- Objective 7: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adults are collected at the Wells Dam fish ladder. The broodstock collection is designed to maintain as much genetic diversity as possible. The broodstock trapping procedure has been developed to allow for removal of representative individuals from the donor population randomly, and to insure that all segments of the run are represented. The detailed broodstock procedure is identified in the PUD/Tribal contract.

Objective 2: Reduce interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Cassimer Bar provides a juvenile rearing environment that isolates the fish from interactions with the natural production stock. Net pen fish are raised and released consistently with conditions listed in the Shorelines Permit.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Broodstock is collected at Wells Dam between July 8th and August 16th. Broodstock collection parallels the relative strength of weekly returns through the collection period. Collection is made in concert with the summer chinook broodstock program operated by WDFW. Assuming a 1:1 sex ratio, fecundity of 2,300 eggs per female, and prespawn mortality of 20 percent, 278 spawners are required to meet the current egg take goal.

Spawning Protocol

A male-to-female spawning ratio of 1:1 is used whenever possible. Males and females are randomly paired by age and size. Fish are killed, dipped in iodophor, wiped, and a pair is spawned into iso-buckets. Female ovarian fluid is collected when the eggs are stripped. Kidney samples are collected from males after the milt is collected. Fork length, scales, and otoliths are collected from the fish after tissue samples are collected. Water is used to help mix the eggs and milt. After mixing, the eggs are drained and water-hardened with iodophor solution.

Acceptable Stocks

The Okanogan River stock of natural production fish is used for hatchery broodstock. This run of fish has been stocked with hatchery fish in the past. A small run of Methow River fish likely mixes with this stock. Straying probably occurs between the Wenatchee River and Okanogan River runs of fish.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs

The primary objective of fish health management at the Cassimer Bar fish hatchery is to produce healthy fry, fingerlings and smolts that will contribute to the fisheries and natural production. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks.

Cassimer Bar has set up both disease control and disease prevention programs to achieve these objectives. These programs include the following standard elements.

- Perform necropsies to diagnose the cause of fish loss.

- Prescribe appropriate treatments and remedies to disease.
- Use a disease control policy that dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Cassimer Bar uses pathogen-free water from wells.
- Use sanitation procedures that prevent introduction of pathogens into and/or within a facility.
- At a minimum, implement the IHOT Fish Health Policy, goals and performance standards.

Fish Health Activities at Cassimer Bar Hatchery

Health Monitoring

- All female broodstock is sampled at spawning for viral pathogens. Both male and females are sampled for Bacterial Kidney Disease.
- Disease tests are conducted by the U.S. Fish and Wildlife Service.
- Whenever abnormal behavior or mortality is observed, a fish health specialist is notified and required to examine affected fish, make a diagnosis, and recommend the appropriate remedial or preventative measures.

Fish and Egg Movement

- Adult fish are not moved off station and juvenile fish are monitored as described above.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Formalin is dispensed into water to control parasites and fungus on eggs and juveniles. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or those under Investigative New Animal Drug permits are used for treatments.

Sanitation

- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other through the eye-up stage.
- Foot baths containing iodophor are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring

Environmental Monitoring

This facility is currently under the minimum size requiring a National Pollution Discharge Elimination System Permit. The following parameters are currently monitored:

- In-hatchery water temperatures
- In-hatchery dissolved oxygen
- In-hatchery pH

Objective 6: Carry out the scope of work and contractual obligations. Monitor and evaluate as outlined in the Wells Settlement Agreement and the Tribal/PUD contract.

Scope of Work

The management entity (Colville Confederated Tribes) is responsible for many contractual obligations. This includes culturing a specified number of fish using accepted fish hatchery techniques. The management entity provides a broodstock

protocol, maintains adult and juvenile holding densities, and develops food conversion rates and spawning protocols. In addition, the management entity is responsible for disease prevention, and monitoring and evaluation of the program at various stages.

Objective 7: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Communication with Co-managers and Cooperators is typically accomplished through the Wells Settlement Committee and the Integrated Hatchery Operations Team.

Record Keeping

Records are kept to meet contractual and management obligations and needs. Reports include monthly and yearly operating reports, smolt evaluations, and yearly program evaluations.

Evaluation Program

Evaluations include monitoring and assessment of hatchery and natural production smolt outmigration from the nursery lake, yearly evaluations, Wells Settlement Committee program review, and facility evaluations conducted by independent consultants.

PERFORMANCE STANDARDS—CASSIMER BAR HATCHERY

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	SOC	276	176 ¹	N/A	
Adult Prespawning Survival	SOC	N/A	70% ¹	N/A	
Egg-take	SOC	255,300	116,074 ¹	N/A	
Eyed Egg-to-Parr Survival	SOC	N/A	84.4% ²	N/A	
Fish Releases	SOC	200,000	74,734 ¹	N/A	
Egg Transfers	SOC	N/A	N/A	N/A	
Fish Transfers	SOC	N/A	N/A	N/A	
Adults Back to River	SOC	N/A	N/A	N/A	
Percent Survival	SOC	N/A	N/A	N/A	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Smolt Size at Release (fish/lb)	SOC	76	71 ¹	N/A	
Proper Release Time	SOC	Mid-May	Yes	N/A	

N/A=Not applicable.

¹ Based on 1993-94 production.

² Based on 1993 production.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	SOC		Yes	--	
Spawning Pop. >200	SOC	N/A	N/A	N/A	
Spawning Ratio Male:Female	SOC	1:1	1:1 ¹	N/A	
Acceptable Stocks	SOC	Yes	Yes	N/A	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	SOC	Yes	Yes ¹	--	

History of Reportable Pathogens—1990-1995

<u>Species/Stock</u>	<u>Water Supply Inc.</u>	<u>Rear.</u>	<u>Virus</u>	<u>BKD</u>	<u>Furunc./ERM</u>	<u>Other/Comments</u>
<i>Cassimer Bar Hatchery</i> SOC			IHN	+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Colville Confederated Tribes.)

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
In-hatchery Water Temperatures	SOC	Variable	53.6°F ¹	--	
In-hatchery Dissolved Oxygen	SOC	N/A	9.89 mg/L	--	

¹ Based on 1993-94 production.

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Carry Out Scope-of-Work	SOC	Yes	N/A	N/A	

Objective 7

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	SOC	Yes	N/A	N/A	

Constraints/Comments—Cassimer Bar Hatchery

Cassimer Bar Hatchery is currently a temporary facility. The program will be evaluated after a three-year period. Fish health guidelines have always been employed to insure that healthy fish are being released into the environment. A number of improvements to the facility will be made if the program moves forward.

INTEGRATED
HATCHERY
OPERATIONS
TEAM



Yakama Indian Nation Hatchery Operation Plans

Coho Acclimation Sites

INTRODUCTION

The Yakama Indian Nation has developed three coho acclimation sites downstream from Wapato Dam on the Yakima River. The first site is located adjacent to Wapato Dam just upstream of the Wapato fish screen in the Wapato Irrigation Project Canal. This facility consists of three pens (20' x 20') anchored to a retaining canal wall. Water exchange and circulation within the pens is produced by canal flow.

The second acclimation site, Roza Wasteway #3, is located 6 miles northwest of Toppenish. The Yakama Indian Nation (YIN) converted the wasteway stilling pool into a fish rearing/acclimation unit. This pool has a rearing volume of 28,000 ft³ (120' x 23' x 13' deep). The Roza Canal supplies 15 cfs to the pool for acclimation. Water passes through a 14-foot radial gate, then down the wasteway to the stilling pool. The stilling pool required an inlet screen to block fish from escaping upstream, an outlet screen to prevent escape to the Yakima River (300 yards down the wasteway), and a check structure to raise the water level for the specified rearing capacity.

The third acclimation site is Granger Pond, an abandoned gravel pit located approximately 5 miles southeast of the town of Granger. The pond is about 1 acre in size, with depths ranging from 6 to 25 feet. There is no surface inlet to the pond. However, groundwater infiltration results in discharge from the pond to the Yakima River. The only modification needed to convert the pond into a acclimation facility was installation of a barrier net across the outlet channel. Water depths at the outlet ranged from less than 1 to 6 feet depending on Yakima River discharge. The net with cement footings was designed to accommodate these variable depths.

PURPOSE

The YIN coho acclimation complex began operating in the spring of 1994. All three facilities were developed to acclimate and improve the survival of 700,000 early (Type-S) coho that are reprogrammed to the Yakima River under Columbia River Fish Management Plan (*U.S. v. Oregon Agreement*). The coho are transported to the three sites from Oregon Department of Fish and Wildlife's Cascade Hatchery. Funds for construction and operation of the complex are administered under the Mitchell Act through the National Marine Fisheries Service and the Yakama Indian Nation.

GOALS

The coho complex acclimates early-run coho produced at lower Columbia River state hatcheries under the Columbia River Fish Management Plan. The program intent is to provide terminal harvest opportunities for fisheries in the lower Yakima River. The Yakima River coho releases also contribute to NE Pacific and Columbia River tribal and non-tribal fisheries.

OBJECTIVES:

Objective 1: Hatchery Production

Type-S Coho

Acclimate 45,000 fish at Wapato Pens, 200,000 at Roza Wasteway #3, and 455,000 at Granger Pond.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult collection, spawning, incubation, and early rearing are all conducted at ODFW's Bonneville and Cascade hatcheries.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit ecological interactions between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which is intended to reduce the retention time in downstream migration. Acclimation to Yakima River water for several weeks is used to reduce the stray rate from the complex. The release strategies described below are used to ensure that fish migrate from the hatchery with minimum interaction with native populations.

Type-S Coho

Final rear 700,000 yearling coho to a size comparable to that of natural production; acclimate to Yakima River water and release from the acclimation complex in May. Fish are representatively marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

No adult fish captured or spawned at these facilities.

Acceptable Stocks

- 1 Type-S Coho - Bonneville/Cascade hatcheries
- 2 Lower River early run stock

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Program—All Stocks

The primary objective of fish health management program at YIN hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. This objective entails preventing introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

YIN with the assistance of state and federal fish health programs, intends to implement both disease control and disease prevention programs at all of its facilities to achieve Objective 4. Disease certification of *U. S. v. Oregon* coho is completed prior to transfer to the tribal acclimation sites in the spring.

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate disease treatments.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventive strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional program and environmental conditions in the hatchery rearing container based on historical disease events.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Utilize pond management strategies to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish of a given length that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows. Overfeeding of the fish and over-accumulation of uneaten food or feces are discouraged.

Fish Health Activities at Coho Acclimation Sites.

Health Monitoring

- Whenever abnormal behavior or mortality is observed, a fish health specialist is notified and requested to examine affected fish, make a diagnosis and recommend the appropriate remedial or preventive measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Pacific Northwest Fish Health Protection Committee (PNFHPC).
- Fish are given a health exam prior to transfers or releases. In some cases subsequent fish health exams will be conducted to obtain further information for management.

Fish Movements

- Movements of fish are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All equipment (nets, tanks, rain gear, boots) is disinfected with iodophor between different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring at the coho acclimation complex has been conducted to identify when changes to hatchery practices are required and to manage fish health. The following parameters are currently monitored:

- In-hatchery water temperatures
- In-hatchery dissolved oxygen

The following are additional parameters which may be monitored in the future to assure protection of the instream environment of the Yakima River:

- Total suspended solids
- Settleable solids
- Upstream and downstream temperatures
- Upstream and downstream dissolved oxygen
- Influent pH/Conductivity
- In-stream Flow/Current

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest professionals. This group provides management direction in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes, and funding entities that meet regularly. IHOT has developed a series of regional hatchery policies and is currently involved in evaluating independent hatchery audits.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to

monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communication: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

PERFORMANCE STANDARDS—COHO ACCLIMATION SITES

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average¹</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	Type-S COH	N/A	N/A	N/A	5
Adult Prespawning Survival	Type-S COH	N/A	N/A	N/A	
Egg-take	Type-S COH	N/A	N/A	N/A	
Green Egg-to-Fry Survival	Type-S COH	N/A	N/A	N/A	
Fry-to-Smolt Survival	Type-S COH	N/A	N/A	N/A	
Pre-Smolt to Smolt Survival	Type-S COH	99%	96.5%	95-98%	2,3
Fish Releases	Type-S COH	700K	668,700	667K-671K	3,4
Egg Transfers	Type-S COH	N/A	N/A	N/A	
Fish Transfers	Type-S COH	N/A	N/A	N/A	
Adults Back to River	Type-S COH	7,000	N/A	N/A	5
Percent Survival	Type-S COH	1.0%	N/A	N/A	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Proper Release Size (fish/lb)	Type-S COHO	15 /LB.	14.5	12-17	1,2,3

N/A=Not applicable.

¹ Program has only been in existence for two years.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	Type-S COH	N/A	N/A	N/A	4,5
Spawning Pop. >200	Type-S COH	N/A	N/A	N/A	4,5
Spawning Ratio Male:Female	Type-S COH	N/A	N/A	N/A	4,5
Acceptable Stocks	Type-S COH	N/A	N/A	N/A	4

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	Type-S COH	Yes	N/A	N/A	

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
In-Hatchery Water Temperatures	Type-S COH	48-55°F	48-53°F	48-53°F	2
In-Hatchery Dissolved Oxygen	Type-S COH	>5 mg/L	9 mg/L	6-12 mg/L	2

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	Type-S COH	Yes	N/A	N/A	

Constraints/Comments—Coho Acclimation Sites

1. Fish are transferred to coho complex at a size too small to achieve a release size of 15 fish/lb.
2. River water temperature exceeds optimal range causing decreased dissolved oxygen in acclimation ponds and/or lethal temperatures.
3. Unaccountable mortality or disease problems at Cascade/Bonneville hatcheries.
4. Low adult returns to Bonneville and Cascade hatcheries reduce number of fish available for broodstock.
5. High water temperatures in the lower Yakima River during early fall can cause a thermal barrier for coho migrating into the river.

K-Basin Acclimation Site

INTRODUCTION

The K-Basin acclimation site is located on the Hanford Reservation, about 1 mile below the Vernita Bridge in the Hanford 100-K Area. Twelve pools on the site were originally designed to settle suspended solids in river water prior to passing it through reactor heat exchangers. Two pools are now used to rear and acclimate fall chinook. Each pool has a capacity of 6.3 million gallons (351' x 127' x 17' deep).

Upriver bright (URB) fall chinook are reared in net pens (20' x 20' x 9' deep) with approximately 35,000 fish per pen. Water from the Columbia River is pumped into the pools for a one-hour daily flush totaling one-third the pool capacity. There is also a recirculation system which brings cooler water from the bottom of each pool and sprays it in each net pen through a PVC manifold.

PURPOSE

This facility was developed for acclimating URB fall chinook, beginning in 1994. Fall chinook from the John Day Mitigation Program are brought from lower Columbia River hatcheries to the K-Basin. Funds for the project have been provided by the Department of Energy and the National Marine Fisheries Service; however, the future funding source is yet to be determined.

GOALS

The long-term goal is to reprogram lower river hatcheries to release one million URB fall chinook upriver, consistent with the tribal, state, and federal goals of "in place, in kind" mitigation. The returning adults will supplement spawning in the Hanford Reach and will provide harvest opportunities for the Hanford Reach, Zone 6 and the lower river. The escapement goal of 45,000 adults above McNary Dam will not change with this project.

OBJECTIVES

Objective 1: Hatchery Production

URB Fall Chinook

Acclimate 500,000 to 1,000,000 fish for release at K-Basin.

- Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.
- Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.
- Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
- Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.
- Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult collection, spawning, incubation, and early rearing are all conducted at a lower Columbia River facility. Bonneville and Little White Salmon hatcheries have been used in the past.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit ecological interactions between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which is intended to reduce the retention time in downstream migration. Acclimation to Columbia River water for several weeks is used to reduce the stray rate from the Hanford Reach

area. The release strategies described below are used to ensure that fish migrate from the hatchery with minimum interaction with native populations.

URB Fall Chinook (John Day Mitigation)

Final rear 500,000 to 1,000,000 URB fall chinook to a size comparable to that of natural production; acclimate to Columbia River water and release from the acclimation complex in June. Fish are representatively marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

N/A

Acceptable Stocks

- 1 Priest Rapids Salmon Hatchery
- 2 Ringold Springs Salmon Hatchery
- 3 Columbia River URB Fall Chinook

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management program at YIN hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. This objective entails preventing introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

YIN, with the assistance of state and federal fish health programs, intends to implement both disease control and disease prevention programs at all of its facilities to achieve Objective 4. Disease certification of John Day Mitigation fall chinook is completed prior to transfer to the K-Basin.

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate disease treatments.
- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on moving diseased stocks.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventive strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional program and environmental conditions in the hatchery rearing container based on historical disease events.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within the facility.
- Utilize pond management strategies to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish of a given length that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows. Overfeeding of the fish and over-accumulation of uneaten food or feces are discouraged. Nets are regularly changed to avoid stress on fish.

Fish Health Activities at the K-Basin Acclimation Site

Health Monitoring

- Whenever abnormal behavior or mortality is observed, a fish health specialist is notified and requested to examine affected fish, make a diagnosis and recommend the appropriate remedial or preventive measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Pacific Northwest Fish Health Protection Committee (PNFHPC).
- Fish are given a health exam by fish health inspectors prior to transfer to the acclimation facility and may be given one prior to release. In some cases subsequent fish health exams may be conducted to obtain further information for management.
- Fish are given an exam for contamination to radionuclides.

Fish Movements

- Movements of fish are conducted in accordance with Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All equipment (nets, tanks, rain gear, boots) is disinfected with iodophor between different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring at the K-Basins has been conducted to identify when changes to hatchery practices are required and to manage fish health. The following parameters are currently monitored:

- In-hatchery water temperatures
- In-hatchery dissolved oxygen

The following are additional parameters which may be monitored in the future to assure protection of the Columbia River instream environment:

- Total suspended solids
- Settleable solids
- Upstream and downstream temperatures
- Upstream and downstream dissolved oxygen
- Influent pH/conductivity
- In-stream flow/current

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest professionals. This group provides management direction in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes, and funding entities that meet regularly. IHOT has developed a series of regional hatchery policies and is currently involved in evaluating independent hatchery audits.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The group meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communication: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and Idaho Department of Fish and Game takes place each year to coordinate proper fish transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS will access all relevant databases in the region. It is hoped that coordinated information collection and reporting will result in consistency among fisheries agencies.

PERFORMANCE STANDARDS - K-BASIN FALL CHINOOK ACCLIMATION

Objective 1

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average¹</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	URB CHF	N/A	N/A	N/A	5
Adult Prespawning Survival	URB CHF	N/A	N/A	N/A	
Egg-take	URB CHF	N/A	N/A	N/A	
Green Egg-to-Fry Survival	URB CHF	N/A	N/A	N/A	
Fry-to-Smolt Survival	URB CHF	N/A	N/A	N/A	
Pre-Smolt to Smolt Survival	URB CHF	99%	98.5%	98-99%	
Fish Releases	URB CHF	1M	595K	496K-694K	
Egg Transfers	URB CHF	N/A	N/A	N/A	
Fish Transfers	URB CHF	N/A	N/A	N/A	
Adults Back to River	URB CHF	N/A	N/A	N/A	
Percent Survival	URB CHF	0.5%	N/A	N/A	

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Proper Release Size (fish/lb)	URB CHF	60	63	62-64	1,2,3

N/A=Not applicable.

¹ Program has been in existence for two years.

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	URB CHF	N/A	N/A	N/A	5
Spawning Pop. >200	URB CHF	N/A	N/A	N/A	5
Spawning Ratio Male:Female	URB CHF	N/A	N/A	N/A	5
Acceptable Stocks	URB CHF	N/A	N/A	N/A	5

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	URB CHF	YES	N/A	N/A	

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
In-Hatchery Water Temperatures)	URB CHF	52-53°F	55-59°F	55-59°F	2
In-Hatchery Dissolved Oxygen	URB CHF	>5 mg/L	5.1-13.9 mg/L	5.1-13.9 mg/L	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery Records for Accuracy and Completeness	URB CHF	Yes	N/A	N/A	

Constraints/Comments—K-Basin Fall Chinook Acclimation Site

1. Fish are transferred to Hanford acclimation site at a size too small to achieve a release size of 60/lb.
2. Columbia River water temperatures exceed optimal rearing standards causing decreased dissolved oxygen in net pens.
3. National Marine Fisheries Service requires 100% marking for ESA concerns with respect to potential straying.
4. Insufficient acceptable URB stock adults return to Columbia River to provide enough fish for the program.

Prosser Tribal Hatchery

INTRODUCTION

Prosser Tribal Hatchery is located on the Yakima River (RM 44) just south of Prosser, Washington. The facility is adjacent to the Chandler Canal Juvenile Monitoring Facility. Elevation of the facility is approximately 500 feet above sea level.

This facility consists of three ponds (150' x 50' x 5' deep) and three raceways (21' x 6' x 3' deep). Each pond has a total rearing volume of 22,300 ft³. An incubation room inside the Chandler Juvenile Facility has four deep troughs with a capacity of up to four million eggs.

Hatchery water flows are provided by the Yakima River (taken from Chandler Canal) and from two wells that have a relatively constant temperatures ranging from 55 to 57°F. The water supply to the incubation room is equipped with a chiller.

PURPOSE

The Prosser Tribal Hatchery is a joint project between the Yakama Indian Nation and the U.S. Bureau of Reclamation. In 1994, these cooperating entities constructed three ponds to acclimate 1.7 million upriver bright (URB) fall chinook (John Day Mitigation). This facility was expanded in 1995 to include adult holding, egg incubation, and early rearing. The expansion provides complete facilities to allow natural supplementation of lower Yakima River and Marion Drain fall chinook substocks. Funds for the construction and operation of the facility are administered under the Mitchell Act through the National Marine Fisheries Service and Yakama Indian Nation.

GOALS

Acclimate URB fall chinook produced at lower Columbia River federal hatcheries under John Day Mitigation and supplement fall chinook that will enhance lower Yakima River natural production and the Marion Drain stock. The hatchery will produce adult fall chinook that will contribute to NE Pacific, Columbia River, and Yakima River tribal and non-tribal fisheries.

OBJECTIVES

Objective 1: Hatchery Production

URB Fall Chinook

Acclimate 700,000 URB fall chinook subyearlings (John Day Mitigation) for release into the lower Yakima River.

Produce 100,000 fall chinook subyearlings (Marion Drain substock) and 900,000 fall chinook subyearlings (lower Yakima River substock).

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adults for the Yakima River John Day Mitigation Program are collected at federal facilities on the lower Columbia River. The lower Yakima River substock will be collected in the adult trap at Prosser Dam and transported to the Prosser Tribal Hatchery approximately 1 mile away. The Marion Drain substock will be collected using a temporary trap near the mouth of Marion Drain and/or hook and line. The

captured adults will be transported to Prosser Tribal Hatchery approximately 35 miles away.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit ecological interactions between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which is intended to reduce the retention time in downstream migration. Rearing on Yakima River water, or acclimation to Yakima River water for several weeks is used to reduce the stray rate from the hatchery. The following release strategies are used to ensure that fish migrate from the hatchery with minimum interaction with native populations.

John Day Mitigation URB

Rear 700,000 subyearlings to a size comparable to that of natural production; acclimate to the Yakima River water and release at the hatchery in May. Fish are representatively marked prior to release.

Lower Yakima River URB Substock

Rear 900,000 subyearlings to a size comparable to that of natural production; acclimate to the Yakima River water and release at the hatchery in May. Fish are representatively marked prior to release if funds are available.

Marion Drain URB Substock

Rear 100,000 subyearling to a size comparable to the natural Marion Drain stock, acclimate adjacent to Marion Drain and released in May. Fish are representatively marked prior to release if funds are available.

OBJECTIVE 3: MAINTAIN STOCK INTEGRITY AND GENETIC DIVERSITY.

Broodstock Selection and Spawning

John Day Mitigation URB

N/A

Lower Yakima River URB Substock

Broodstock selection and spawning practices will include 1) collecting fish throughout the range of spawning timing, 2) using a 1:1 male-to-female spawning ratio whenever possible, and 3) random pairing of males and females by size and age.

Marion Drain URB Substock

Broodstock selection and spawning practices will include 1) collecting fish throughout the range of spawning timing, 2) using a 1:1 male-to-female spawning ratio whenever possible, and 3) random pairing of males and females by size and age.

Acceptable Stocks

John Day Mitigation URB

Eggs and/or fish from other facilities with acceptable stocks are imported to achieve production goals while maintaining regional genetic integrity. The stocks approved for release from the Prosser Tribal Hatchery are listed below in descending order of preference.

- 1 Upriver bright (Priest Rapids Hatchery fall chinook)
- 2 Upriver bright (Ringold Hatchery fall chinook)
- 3 Columbia River upriver bright fall chinook

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at YIN hatcheries is to produce healthy smolts that will contribute to the fisheries and to natural spawning. This objective entails preventing introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

YIN, with the assistance of state and federal fish health programs, intends to implement both disease control and disease prevention programs at all of its facilities to achieve Objective 4. Disease certification of John Day Mitigation fall chinook is completed prior to transfer to the Prosser Tribal Hatchery in the spring. The programs listed below apply mainly to the Marion Drain and lower Yakima River substocks.

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate disease treatments.

- Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention (Proactive)

- Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventive strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional program and environmental conditions in the hatchery rearing container based on historical disease events.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
- Utilize pond management strategies to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish of a given length that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows. Overfeeding of the fish and over-accumulation of uneaten food or feces are discouraged. Ponds or raceways are regularly vacuumed to avoid stress on fish caused by other cleaning methods.

Fish Health Activities at Prosser Tribal Hatchery

Health Monitoring

- Whenever abnormal behavior or mortality is observed, a fish health specialist is notified and requested to examine affected fish, make a diagnosis, and recommend the appropriate remedial or preventive measures.
- Reporting and control of selected fish pathogens are conducted in accordance with the Pacific Northwest Fish Health Protection Committee (PNFHPC).

- Fish are given a health exam prior to transfers or releases. In some cases subsequent fish health exams will be conducted to obtain further information for management.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the YIN Fish Health Policy in concurrence with PNFHPC.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin is dispensed into water for control of parasites and fungus on eggs and juveniles. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration or authorized under an Investigative New Animal Drug (INAD) program are used for treatments.

Sanitation

- All eggs brought into the facility are surface-disinfected with iodophor.
- All equipment (nets, tanks, rain gear, boots) is disinfected with iodophor before transfer from one lot of fish or eggs to another lot.
- Different fish/egg lots are isolated from each other in separate incubation units or tanks.
- Foot baths containing iodophor are strategically located on the hatchery grounds to control the spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring at Prosser Tribal Hatchery has been conducted to identify when changes of hatchery practices are required and to manage fish health. The following parameters are currently monitored:

- In-hatchery water temperatures
- In-hatchery dissolved oxygen concentrations

The following are additional parameters which may be monitored in the future to assure protection of the Yakima River below the hatchery outfall:

- Total suspended solids
- Settleable solids
- Upstream and downstream temperatures
- Upstream and downstream dissolved oxygen
- Influent pH/Conductivity
- River discharge

Objective 6: Communicate effectively with other salmon producers and managers.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to encourage communication among anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of fishery managers. This group provides management direction in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group comprised of representatives from fish management agencies, tribes and funding entities, meets regularly. IHOT has developed a series of regional hatchery policies and is currently evaluating independent hatchery audits.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private aquaculture companies. The group meets twice a

year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State, federal and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess whether targets are being met.

In-Season Communication: Communication among PAC, the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and Idaho Department of Fish and Game takes place each year to coordinate fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Record Keeping

Records are kept in a consistent manner employing standard formats. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS will access all relevant databases in the region. It is hoped that coordinated information collection and reporting will result in consistency among fisheries agencies.

PERFORMANCE STANDARDS—PROSSER TRIBAL HATCHERY

Objective 1

<u>Measures</u>	<u>Species¹</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adult Capture	JDM-URB	N/A	N/A	N/A	
	LYR-URB	540	N/A	N/A	1
	MD-URB	62	N/A	N/A	1
Adult Prespawning Survival	JDM-URB	N/A	N/A	N/A	
	LYR-URB	90%	N/A	N/A	1
	MD-URB	90%	N/A	N/A	1
Egg-take	JDM-URB	N/A	N/A	N/A	
	LYR-URB	1.2M	N/A	N/A	5
	MD-URB	132K	N/A	N/A	5
Green Egg-to-Fry Survival	JDM-URB	N/A	N/A	N/A	
	LYR-URB	84%	N/A	N/A	
	MD-URB	84%	N/A	N/A	
Fry-to-Smolt Survival	JDM-URB	N/A	N/A	N/A	
	LYR-URB	90%	N/A	N/A	
	MD-URB	90%	N/A	N/A	
Pre-Smolt to Smolt Survival	JDM-URB	99%	N/A	N/A	1,3,7
	LYR-URB	N/A	N/A	N/A	
	MD-URB	N/A	N/A	N/A	
Fish Releases	JDM-URB	700K	N/A	N/A	
	LYR-URB	900K	N/A	N/A	
	MD-URB	100K	N/A	N/A	5
Egg Transfers	JDM-URB	N/A	N/A	N/A	
	LYR-URB	N/A	N/A	N/A	
	MD-URB	N/A	N/A	N/A	
Fish Transfers	JDM-URB	N/A	N/A	N/A	
	LYR-URB	N/A	N/A	N/A	
	MD-URB	N/A	N/A	N/A	
Adults Back to River	JDM-URB	5,250	N/A	N/A	2
	LYR-URB	6,750	N/A	N/A	2
	MD-URB	750	N/A	N/A	2
Percent Survival	JDM-URB	0.75%	N/A	N/A	
	LYR-URB	0.75%	N/A	N/A	
	MD-URB	0.75%	N/A	N/A	

¹JDM-URB: John Day Mitigation, upriver bright
 LYR-URB: Lower Yakima River, upriver brights
 MD-URB: Marion Drain, upriver brights

Objective 2

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Proper Release Size (fish/lb)	JDM-URB	90	92	64-120	3
	LYR-URB	90	N/A	N/A	
	MD-URB	90	N/A	N/A	

Objective 3

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Collect Adults Throughout Run	JDM-URB	N/A	N/A	N/A	
	LYR-URB	Yes	N/A	N/A	
	MD-URB	Yes	N/A	N/A	
Spawning Pop. >200	JDM-URB	N/A	N/A	N/A	
	LYR-URB	Yes	N/A	N/A	
	MD-URB	N/A	N/A	N/A	
Spawning Ratio Male:Female	JDM-URB	N/A	N/A	N/A	
	LYR-URB	1:1	N/A	N/A	
	MD-URB	1:1	N/A	N/A	

Objective 4

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Adhere to Disease Policy	JDM-URB	Yes	-	-	
	LYR-URB	Yes	-	-	
	MD-URB	Yes	-	-	

Objective 5

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
In-Hatchery Water Temperatures	JDM-URB	52-58°F	55°F	52-59°F	
	LYR-URB	40-58°F	N/A	N/A	
	MD-URB	40-58°F	N/A	N/A	
In-Hatchery Dissolved Oxygen	JDM-URB	>5 mg/L	N/A	N/A	
	LYR-URB	>5 mg/L	N/A	N/A	
	MD-URB	>5 mg/L	N/A	N/A	

Objective 6

<u>Measures</u>	<u>Species</u>	<u>Hatchery Goal</u>	<u>5-Year Average</u>	<u>Range</u>	<u>Constraints</u>
Check Hatchery	JDM-URB	YES			6
Records for Accuracy	LYR-URB	YES			6
and Completeness	MD-URB	YES			6

Constraints/Comments—Prosser Tribal Hatchery

1. High water temperatures in the lower Yakima River during the summer and early fall can increase stress-related mortality of returning adults. Temperatures may also increase the probability of mortalities due to such diseases as columnaris, and may also increase egg mortality from the spawned adults.
2. High water temperatures in the lower Yakima River during early fall may cause a migration thermal barrier to returning adults.
3. Fish are transferred to Prosser Hatchery for acclimation at a size too small to achieve a release size of 90 fish/lb.
4. Low return of adults to Priest Rapids or lower river fall chinook facilities which would result in reduced number of fish available for broodstock.
5. Low return of adults to lower Yakima River and/or Marion Drain resulting in fewer fish available for broodstock.
6. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.
7. A comprehensive basin-wide production plan has not been completed at this time.

